The Chemical Age

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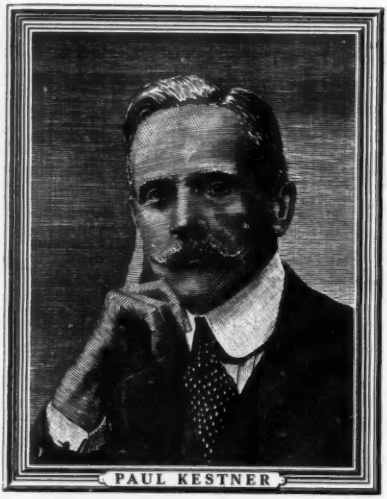

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Preventing Accidents

THE record of the chemical industry in minimising the risk of accidents is widely respected. Every day in hundreds of factories potentially hazardous materials—inflammable, explosive, corrosive, or toxic—are being handled. Very often high temperatures and pressures are applied to the materials of chemical industry and in some processes great heat is evolved. It is because these hazards are on the whole greater than those in other industries that safety measures have been studied with exceptional vigour and, to quote from the notable 1949 Report of the Association of British Chemical Manufacturers, "actual hazards are now probably less than in other industries." Indeed, in this matter the Association has played a leading part. Twenty-two years ago it issued a code of Model Safety Rules for chemical factories and this code is periodically revised to meet changing practices and new hazards. Literature dealing with safety measures is steadily distributed. The Association employs a full-time Safety Officer and may still be the only trade organisation to have taken this step; certainly it was the first to do so. There has been permanent co-operation with the Home Office and the Factory Department of the Ministry of Labour, the Department of Scientific and Industrial Research, and the Royal Society for the Prevention of Accidents. One token of all this effort is the infrequency with which serious accidents in chemical works are reported. There is, nevertheless, no room for complacency. Indeed, when a high standard of works safety has become well established there is always some danger that one of the most potent causes of accidents—over-confidence—may also have been created.

In the most precise meaning of the word, an accident is an event that arises from unconsidered or unanticipated causes. Many industrial accidents would not fit this description for carelessness in dealing with known and forseeable hazards has been a contributory factor; such accidents occur in spite of considerable experience and not as a result of lack of experience. Human nature being what it is, there must probably be a small but steady percentage of damage to persons and property through this latter type of accident so long as industry exists. In a safety-conscious industry or factory this percentage can be forced down to an irreducible minimum but only the impracticable idealist would suppose that it could be stabilised at a nil figure. When such conditions have been reached—

and it would certainly seem that this is the case with most chemical factories—attention might well be focussed upon the "purer" type of accident, the occurrence which has unusual and previously unencountered causes or the mishap which has a complex rather than simple case-history. Events of this kind may not in fact lead to serious damage. Luck is sometimes a balancing factor when hazardous circumstances arise. Nevertheless, once the hazardous possibilities in some practice or routine operation have been exposed the need for precautions is no longer unknown.

The Factory Department of the Ministry of Labour and National Service must be congratulated upon their quarterly publication, "Accidents, How They Happen and How To Prevent Them." This journal should be much more widely distributed in factories. It should not be read only by management but also by foremen and general factory staff. So far, however, this regular publication, though it costs only 9d. a copy or 3s. 6d. for a posted annual subscription, is not very well known and would seem to have enjoyed all too little publicity. It has two most practical virtues. It is a medium by which the accident experiences of all industries may be shared. Secondly, it is entirely presented in practical terms—the complete text describes and analyses actual accidents and discusses the means of prevention. In the chemical industry, particularly for smaller works where mechanical methods of handling have recently increased, this official publication will be especially valuable for it draws attention mainly to the hazards of mechanical equipment. More important still, the accident cases reported tend to be of the unusual rather than usual class.

For example, in the most recent issue an accident with a barrel hoist of the endless chain type is described. At the upper level barrels rolled off down an inclined runway. The accident occurred because they were not being removed quickly enough. The released barrels jammed and one of them near the top of the hoist was forced upwards; it rolled back from the runway, falling on to the lower floor and hitting a workman. To prevent a further accident of this kind a light frame was fitted above the runway; should a barrel be forced upwards off the runway, it lifts this framework which immedately trips a switch cutting off the power. The automatic stopping of the hoist prevents further intensification of the barrel congestion. This accident could easily occur in any chemical factory using a chain-hoist for handling barrels or drums. It has a simple enough cause yet it is the type of mishap that must probably occur before its possibility is a genuinely forseeable risk.

Ever-increasing mechanisation of material handling brings new hazards. Generally, these will be safeguarded more easily than the specific hazards of the chemical industry.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s. single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

Notes and Comments

The Group Habit

THE sub-dividing policy of the Society of Chemical Industry is steadily extending. The former Microbiological Panel of the Society's Food Group, founded in 1937, is now itself to be turned into a Group, and it is also currently proposed to form an entirely new Group to cover the subject of oils and fats. Both of these ventures have virtually sprung from the Food Group, the first of the Society's experiments in specialised sub-division. Those who deplore the specialised tendencies of modern science will regret rather than applaud these developments; nevertheless, it is easy to refute such criticisms with factual arguments. The pattern of scientific organisation must follow the pattern of science itself and no field of investigation is more specialised and departmentalised than that of applied chemistry. Not to accept this as a fact of our times is to emulate King Canute or Colonel Blimp. Of all our institutions the Society of Chemical Industry requires the Group system of sub-division the most. At the same time, the dangers of the Group system —which are, of course, the old dangers of narrowed specialisation and study— are no less real. Indeed, the more sub-division there is, the more these dangers are increased. Scientists must somehow solve this difficult dilemma, and just as much practical attention must be given to means of keeping generally together as to new means of branching off into refined departments. The indictment about specialists knowing more and more about less and less is not an anachronism even though it may be old. It seems to be a corollary of the expansion in Group formation for the media of scientific integration to be also intensified. The *Quarterly Reviews* of The Chemical Society are one example, but more efforts of this nature may well be considered. The position of the young chemist entering industry requires particular thought. He is more and more likely to channel his further development within a Group. If great care is not taken with the new plans for developing technological education, this Group specialisation may restrict his view of science even before he actually enters this or that branch of chemical industry. Specialisation is never more dangerous than when it impinges too soon upon the chemist's career and this hazard above all must be safeguarded.

Pollution Boomerang ?

AN interesting legal case is pending in America. A well-known chemical and food concern is claiming damages from two dredging companies whose operations are said to have polluted the water source for the plaintiff company's oil refining works. It is said that the dredging work stirred up the river so much that the adjoining creek—from which the works drew its water—became overcharged with mud and silt, and this led twice to the temporary shutting down of oil refining and hydrogenation. An injunction against further dredging operations as well as damages is being sought. This undoubtedly raises an interesting point in law. How far do the rights of a natural water-using factory go in this matter of protecting the quality of that water? Can a downstream user privately impose sanctions upon an upstream disturber? On the whole, the legal attitude of the United States towards river and stream pollution has been much less definite than our own. Nevertheless, should the chemical company succeed in its claim, the verdict may well prove something of a boomerang. It would create a precedent for innumerable downstream claims of a similar nature—and it is possible that the chemical industry would find itself more sued than suing. The control of natural waters' purity should surely be left to public administration.

Increasing Sulphuric Acid Totals

Higher Production and Consumption

TOTAL production in the United Kingdom of sulphuric acid and oleum for the year 1950 was 1,980,470 tons compared with 1,791,740 tons in the previous year, and 1,601,488 tons in 1948 for the U.K. and Eire combined. Total consumption in the U.K. in 1950 was also marked by an increase with a figure of 1,816,134 tons as against 1,677,509 in 1949 as against a combined figure for the U.K. and Eire of 1,613,208 in 1948.

The final quarter of last year also showed an increase in production and consumption in the U.K. compared with July-September 1950, as shown by the classified summary issued by the National Sulphuric Acid Association, Ltd. Comparative figures were: production 449,621 tons (442,968), consumption 445,525 tons (445,312).

Noteworthy increases in consumption of individual items compared with the previous three months' period included: bromine 3856 tons (2916); clays (fuller's earth) 3055 tons (2861); drugs and fine chemicals 3631 (2975); hydrochloric acid 18,089 (16,295); plastics (not otherwise classified) 5279 (4511); sulphate of ammonia 67,242 (59,554). Reductions were: agricultural purposes 387 tons (11,800); superphosphates 86,977 (102,294).

PRODUCTION OF SULPHURIC ACID AND OLEUM
(Tons of 100% H_2SO_4)

	Chamber only	Contact only	Chamber and Contact
Stock, 1st Oct., 1950	28,245	32,594	60,839
Production	167,979	281,642	449,621
Receipts	25,905	12,065	37,970
Oleum feed	—	1,870	1,870
Adjustments	−358	−32	−390
Use	86,556	130,712	217,268
Despatches	103,169	160,217	263,386
Stock, 31st Dec., 1950	32,046	37,210	69,256
Total capacity represented	195,270	308,560	503,830
Percentage production	86.0%	91.3%	89.2%

RAW MATERIAL
(Tons)

	Pyrites	Spent Oxide	Sulphur & H_2S	Zinc Concentrates	Anhydrite
Stock, 1st. Oct. 1950 ...	66,566	189,080	62,308	47,367	70
Receipts ...	42,156	63,220	89,518	45,568	47,718
Adjustments ...	−116	+329	−274	−124	—
Use	49,047	50,079	88,344	43,436	47,263
Despatches ...	94	9,562	231	530	—
		357*			
Stock, 31st Dec., 1950 ...	59,465	192,631	62,977	48,845	525

* Used at Works for purposes other than sulphuric acid manufacture.

Note.—The above figures include production at Government plants where those plants are producing acid for trade purposes.

CONSUMPTION OF SULPHURIC ACID AND OLEUM
UNITED KINGDOM
(1st October–31st December, 1950)

Trade Uses	Tons 100% H_2SO_4
Accumulators	3,023
Agricultural purposes	387
Bichromate and chromic acid	3,535
Bromine	3,856
Clays (fuller's earth, etc.)	3,055
Copper pickling	617
Dealers	5,580
Drugs and fine chemicals	3,631
Dyestuffs and intermediates	24,082
Explosives	4,658
Export	922
Glue, gelatine and size	134
Hydrochloric acid	18,089
Hydrofluoric acid	2,730
Iron pickling (including tin plate)	25,967
Leather	1,719
Metal extraction	669
Oil refining and petroleum products	15,396
Oils (vegetable)	2,610
Paint and lithopone	35,585
Paper, etc.	1,071
Phosphates (industrial)	1,280
Plastics, not otherwise classified	5,279
Rayon and transparent paper	56,504
Sewage	2,938
Soap and glycerine	8,861
Sugar refining	158
Sulphate of ammonia	67,242
Sulphates of copper, nickel, etc.	6,517
Sulphate of magnesium	1,606
Superphosphates	86,977
Tar and benzole	4,829
Textile uses	6,560
Unclassified	44,458
Total	445,525

To Deliver Mather Lecture

DR. J. C. WITHERS, Ph.D., F.R.I.C., F.T.I., a vice-president of the Textile Institute, and former head of the Library and Information Service of the British Cotton Industry Research Association, now living in retirement at his home in Stockport, has agreed to deliver the Institute's Mather Lecture for 1951, which is to follow the Institute's annual general meeting at the Midland Hotel, Manchester, on Wednesday, 18 April. Dr. Withers proposes to deal with information on textiles, a subject in which he has been concerned for many years in his position with the British Cotton Industry Research Association. The Mather Lecture was inaugurated in 1919 to perpetuate the memory of the late Sir William Mather, president of the institute in 1915-17, and promoter of the Institute's Foundation Fund in 1919.

Ferric Chloride Solutions as Demercurisators

IT has been established that the process of demercurisation may be accelerated and intensified by emulsification of the mercury, an aqueous solution of ferric chloride being suitable for this purpose. The protective action of the film formed by a ferric chloride solution on mercury drops is more reliable than the action of films of mercurous chloride and mercury sulphide. When using ferric chloride solution as a demercurisator under industrial conditions, however, it is necessary to take into account its corrosive substances.

These conclusions are drawn from an investigation described by S. F. Yavorovskaya in *Gigiena i Sanitariva*, whose paper on this subject has been translated by the Department of Scientific and Industrial Research.

The author points out that almost all chemical methods of demercurisation are based on the formation of a protective film on the surface of the drops of mercury, which stops or lessens its evaporation. Examples of this method are the use of hydrogen sulphide, an aqueous solution of hydrogen sulphide, sodium sulphide solution, and an acidified solution of potassium permanganate. Laboratory experiments and trials under industrial conditions have shown that by these methods of treatment the evaporation of mercury from the surface of the drops is prevented for only a short time, since infinitesimal cracks are formed in the protective film when the drops of mercury expand. Small temperature fluctuations are sufficient to bring this about.

Lessens Evaporability

The positive action of protective films is to lessen the evaporability of mercury, the effectiveness with which this is accomplished depending on the dimensions of the drops, the stability of the compound forming the protective film, and also on the thickness and toughness of the film. The surface protective films also have a negative action which consists in stopping the chemical reaction of mercury with the demercurisator used. Elovich and Turchenko have established that chemical demercurisation is effective only when the "split mercury" is in a state of sufficient comminution.

Taking these various factors into consideration, the investigators concluded that the demercurisator had to be a substance which, apart from a chemical action, would have an emulsifying effect on the mercury and would turn it artificially into a highly comminuted or disperse state, thus increasing the active surface of the mercury and its reactivity.

Colloidal and true solutions of some chemical substances are capable of emulsifying mercury and thus lowering its high surface tension, among these true solutions being ferric chloride.

Instantaneous Transformation

Observations under laboratory conditions showed that by mixing metallic mercury with a 20 per cent solution of ferric chloride, the mercury is almost instantaneously transformed into a fine grey powder. The drops of mercury lose their spherical shape after 20-30 minutes and are covered by a protective film. At first the film is unstable and, as its grey colour shows, is composed of mercurous oxide. After some days the colour of the particles of emulsified mercury becomes lighter because of the appearance of white calomel. Finally mercuric oxide is formed and the colour changes to orange. A decrease in the quantity of visible free mercury is observed along with the change in the constitution of the protective film.

The effectiveness of the action of a ferric chloride solution on mercury depends on the initial amounts of mercury. For example the transformation of a hundredth part of a gram of mercury into a 90 per cent compound takes place on the third day of treatment; about 20 days are required in the case of quantities of the order of 3-5 grams.

Protective films formed by a solution of ferric chloride even on drops of mercury of diameter 3-4 m. possess a high protective action. An insignificant quantity of mercury vapour got through after 2½ months, which coincided with the moment when cracks were formed in the protective film. At the end of three months the amount getting through had not increased, which indicated a persisting interaction of the ferric chloride solution with the metallic mercury.

The protective action of a 20 per cent solution of ferric chloride was compared under laboratory conditions with that of

some other substances used as demercurisators, including distilled water, transformer oil, 10 per cent nitric acid, $KMnO_4$ solution, hydrogen sulphide solution, powdered sulphur, sulphur suspension (40 per cent), clay (soapstone) and clay suspension (50 per cent). In the case of $FeCl_3 \cdot 6H_2O$ solution (20 per cent) the vapours took 75 days to get through, the times noted with the other demercurisators tested ranging from 6 hours to 45 days. These experimental results indicated that a ferric chloride solution would serve the purpose of rendering split mercury harmless.

Lowering Effect

A test was then made of the volatility of metallic mercury after emulsification with a solution of ferric chloride. It was found that a 20 per cent solution of ferric chloride exerted a strongly lowering effect on its volatility, despite the increase in surface brought about by its emulsification. At the beginning of the experiment the solution was 2-2.5 mm. thick. After 40 days in a closed room it dried out, at which point there was in some cases—but not invariably—an insignificant increase in the content of mercury vapours. With a linoleum surface and an initial concentration of 1.5 of mercury vapours in mg/m3, the mercury content of the room air in mg/m3 was 0.01 after 1 day, 0.005 after 15 days and 0.070 after 70 days.

Hence protective films formed by ferric chloride on mercury drops are more durable and more stable than films of mercury sulphide or mercurous chloride. After prolonged treatment with ferric chloride, the metallic emulsified mercury is transformed fairly completely into a mercury compound with a much lower vapour tension.

An examination of the ease and completeness of removal of emulsified mercury after a short treatment with a ferric chloride solution, as compared with treating the mercury with an acid solution of potassium permanganate, showed that an almost complete removal of the mercury took place even after the ferric chloride solution had acted on it only for a short time.

Notable Acid Reaction

The 20 per cent ferric chloride solution used was hydrolised and hence its reaction was markedly acid.

A ferric chloride solution cannot be used as a demercurisator on all materials, metallic surfaces with the exception of lead being corroded by a 20 per cent solution. A film of lead chloride is very quickly formed on a lead surface and this prevents further solution of the lead. A ferric chloride solution, however, may be applied successfully to a painted wooden surface, to tiles, linoleum and concrete. Yellow stains remain on an unpainted wooden surface, on plaster, and on concrete after the treatment. A partial solution of the alkaline constituents of the concrete takes place.

The investigators recommend that a ferric chloride solution should be used as a demercurisator after removing the majority of the mercury with a vacuum cleaner, Perigoud paste, or some other means. If the conditions of work permit, the solution should remain on the surface to be treated until it has completely dried out. The emulsified mercury may easily be washed off with a stream of water. Rubbing is inadvisable, since it is liable to destroy the protective films on the mercury particles if they are not completely transformed into a compound.

Quality in Wool Assessment

KEEN interest in the trade was aroused by a description of research work into the scientific assessment of quality in wool outlined by Professor J. B. Speakman in a recent address to members of the West Riding section of the Society of Dyers and Colourists at a meeting in Bradford.

Fabric made from wool yarn which had been stored for a long time was, the professor pointed out, quite different from fabric made from yarn no more than a fortnight old, where in both cases electrification and regain had died out.

The final finish of a fabric must depend on its relaxation. Storage of tops, for example, was not only to allow relaxation to die out, but also to allow tension which had been built up to die away.

For the first time significant figures were revealed in connection with the sulphur content of wool.

Previously it had been thought that the sulphur content of a single staple or flock of wool was the same throughout. Professor Speakman demonstrated that this was, however, not the case. In one example of Lincoln wool the sulphur content was shown to vary from 0.98 to 3.97 per cent.

This might be the reason why certain wools, when dyed, had a skittery dyeing effect—because of the number of variations of which there were even in a single flock of wool.

Peptide Syntheses

IN THE complex and increasingly important field of protein or amino acid chemistry the polypeptides occupy an extensive position. Theoretically, their possible number can run into many millions, by simple permutation of the number of amino acids; with only ten of these acids the possible polypeptides number 750,000.

The polypeptides are formed by linking up amino groups with carboxyls of another molecule with elimination of water. All amino acids can be members of the chain and need not be in any particular series.

In a recent review of peptide syntheses during the past 50 years Professor Dr. Th. Wieland, Mainz University, had to limit his survey to certain parts only of this vast realm, for example, antibiotics such as gramicides, actinomycines, or oligopeptides. (*Angew. Chem.* 1951, *63*, 7-14 Jan.). Professor Wieland observes that, although the peptide linkage between two amino acids may be a solved problem, yet attempts to lengthen the chain in a predetermined manner have to face many unexpected difficulties.

He begins his survey with the pioneer work of Emil Fischer whose first synthesis, developed with E. Fourneau about 1901, was that of a dipeptide, glycylglycin, by saponifying diketopiperazin with strong mineral acid. This was soon followed by combining the halogen-substituted carboxylic acid chloride with amino acids, and then by treatment with ammonia, exchanging the halogen for an amino group. Wieland states that O. Süs (in unpublished work) has recently found that the chlorides of N-acylated or free amino acids without previous isolation may be used for peptide synthesis. If, for example, phenacetylglycin is treated in benzol with PCl_5 and then with glycin ester and dimethylanilin there is trouble-free formation of phenacetylglycinester. This reaction has been carried to the tetraglycin ester stage.

Curtius of Heidelberg

One worker in this field anti-dates Fischer and that is Th. Curtius of Heidelberg, whose researches from 1881 with hippuric acid led to formation of benzoyl di- and hexa-glycin and other syntheses in the peptide field that have since been developed by Pascu and Wilson, Frankel and Katchalski, Schramm and many others. Among the more recent advances are those recorded by Hofmann & Magee in the U.S.A. (1949) on the production of high polymer glycin peptides.

A further important advance was made by Bergmann & Zervas in 1932 with the introduction of a chlorocarbonic benzyl ester into the amino group. The benzyl ester could be easily prepared from phosgene and benzyl alcohol in toluol solution, and because benzoyl chloride reacts with amino groups (Schotten-Baumann reaction).

Easily Split Off Radicles

Stevens & Watanabe in U.S.A. have lately reported the use of the carboxyl-allyl-radicle with allyl-chloroformate and their introduction under Schotten-Baumann conditions into the amino groups of various amino acids (J.A.C.S. 1950, *72*, 725). In this class of easily split off acyl radicles should also be mentioned the phthalyl radicle, and the work of King (F.E.) and Kidd in this country, Grassmann & Schulte-Ubbing and others (1949-1950), leading to the production of di- and tripeptides in good yields. Ehrenvärd has lately reported another member of this group in phenyl-mercaptocarbonyl chloride (*Nature* 1947, *159*, 500) which reacts at room temperature with amino acid esters in ether.

The halogenides and azides so far dealt with may be regarded as anhydrides from amino acids and mineral acids. There are many other compounds of this type that may be used in linking up the peptide chain. Firstly, there are those with substituted phosphoric acids. Chantrenne has noted that anhydrides from carbo-amino acids and phenyl-phosphoric acid in aqueous solution at pH 7.4 and temperature 37°C. react with amino acids with peptide linkage, the requisite energy being supplied through formation of phenyl phosphate (*Nature*, 1949, *164*, 576). Similar results have been obtained by Sheehan & Frank (*J.A.C.S.*, 1950, *72*, 1312). Ten years earlier Lynen had used the silver salts of substituted phosphoric acid with acyl-amino acid chlorides in neutral solution.

In the class of anhydrides with organic acids, the present author (Wieland) and co-workers have carried the earlier work of Curtius much further, using benzoyl chloride and glycin-silver with formation of an intermediary glycon benzoate. If a further molecule of benzoyl chloride is reacted with this aphydride, hippuric-benzoic acid anhydride is formed together with free HCl which immediately reacts

with further glycin silver to form glycin and silver chloride.

Hippuricbenzoate and glycin combine to form benzoyl-liglycin with peptide linkage and this is repeated or continued until the formation of benzoyl-hexaglycin (gamma acid) noted by Curtius can be explained. (*Liebigs Ann.* 1950, *569*, 117, 122.) In the organic acid class of anhydrides the earlier work of Bergmann may be again noted, e.g. with glutamic acid anhydride, peptides from which play an important role in biochemistry.

The Cyclic Anhydrides

The next group considered is the cyclic anhydrides, beginning with the so-called Leuchs' bodies, studied by H. Leuchs in the Fisher Institute in 1903; and followed by the phosgene reaction in alkaline aqueous solution with N-phenylglycin, studied by Fuchs about 1921-2. The phosgene process was later developed by the Farbenfab. Bayer, or Leverkusen ; and also in England, with unsubstituted amino acids. It was found that by passing phosgene into a suspension of amino acids in dioxane or tetrahydrofurane at 30-40°C. the carbaminic chloride was first obtained, and then, by evaporating *in vacus*, the solvent, HCl and the anhydrides.

Various polymerisation methods are next discussed, including Bailey's important work with amino acid esters and triethylamine (*Nature* 1949, *164*, 889) and condensation of the peptide ester with a new anhydride, leading to the preparation of several di- and other polypeptides. W. T. Astbury *et al.* (*ibid* 1948, *162*, 596) found, as Wessley had done with pyridine, that polymerisation was particularly easy in the presence of tertiary bases. Among other recent research is that in connection with isocyanates and other aids to polymerisation, including Petersen's Ger. pat. No. 752,757 (cf. *Liebig's Ann.* 1950, *562*, 213).

The next group to be studied among the cyclic anhydrides includes mercaptothiazolone, in which a considerable amount of of work has been reported in this country: Heilbron, Cook & Levy (*J. Chem. Soc.* 1949, 2099, 2323, etc.; 1950, 646). A further group includes oxazolone and azlactone. These heterocyclics are energetic compounds formed by water elimination from the carboxyl and lactim groups. In structure they are analogous to the enol-esters and are intermediate in energy content between pure anhydrides and acid esters.

Some early work by Mohr and others is described, including that of Karrer and co-workers in Switzerland which is of great interest. They were able to obtain the oxazolone of hippuric acid by action of diazomethane on hippuryl chloride. The oxazolones of course have in recent years acquired intensive interest and importance in connection with penicillin synthesis (Cf. Karrer's *Organic Chem.* 1947, 3rd edit. pp. 769-772; also *Chemistry of Pencillin*, Princeton University Press 1949). Wieland here makes the interesting suggestion that, although experimental evidence is at present insufficient, it is feasible to suppose that the formation of oxazolones from suitable N-acylated amino acids and acid chlorides or anhydrides proceeds via mixed anhydrides. An illustrative structural formula is given.

Finally, the enzymatic synthesis of peptides is briefly reviewed, including some thermodynamic or energy considerations for enzymatic formation of dipeptides examined by Schultz (Virtanen *et al.* (*Naturwiss.* 1950, *37*, 139, 196) together with energy balance equations proposed by F. Lynen (private communication).

In some of these reactions both components may remain for the most part undissociated. Thus, Bergmann and coworkers in 1938-39, had shown that under the action of papain, hippuric acid and anilin combined to form hippuric anilide. This reaction is thermodynamically neutral or rather exothermic, so that through the catalyst there was established rapidly an equilibrium which, under the conditions of concentration, etc., tended towards the " peptide " side.

That, in such a reaction, other and probably steric factors play a part, has been shown recently by Waldschmidt-Leitz & Kühn who, with various aromatic amines obtained varying yields of amides from hippuric acid in the presence of papain. (*Hoppe-Seylers Z. physiol. Chem.* 1950, *285*, 23). Reference is also made to recent research with liver preparations and formation of hippuric acid and its *p*-amino derivatives, by Borsook *et al.* including the use of ATP (adenosintriphosphate) as an energy source (*J. biol. Chem.* 1946-49, *166*, 261; *168*, 121; *169*, 119; *171*, 121; *179*, 705; *182*, 171).

Liver Homogenates

Much recent American work has been undertaken with liver homogenates and protein *in vitro* synthesis; also glutathion synthesis and the effect of ATP, e.g., with pigeon liver extracts. In many cases the presence of ATP was definitely essential. The nature of the intermediate formed by linkage between ATP decomposition and amide synthesis is uncertain, although there appear to be several possibilities.

The nearer one approaches the conditions ruling in the living cell, says Wieland, the

more complex become the systems to be studied, and so far it has not been possible to obtain a clear picture. Some relevant theories are, however, briefly discussed. Reference is made to work of Hanes and co-workers with proteolytic ferments and conversion of the glutamyl radicle to other amino acids (valin, leucin or phenylalanin) with the formation of a new gamma-peptide (*Nature* 1950, *166*, 288). Chromatographical methods had here an interesting application.

Even if the riddle has been solved as to the specific energy-supplying constituents in biological peptide synthesis, the other important and relevant question remains as yet unanswered, namely: How does the cell with unerring precision combine into the most varied peptides and proteins the same amino acids from the variegated collection of these presented to it? Prof. Wieland considers that the discussion of this problem is outside the scope of his present survey.

Alkali Cartel Ended

U.K. Firms Involved

CARTEL agreements between American and foreign producers were cancelled and annulled and the defendants were enjoined from future operations of a similar nature in a sweeping decision recently handed down in United States District Court, New York. Judge Samuel H. Kaufman, declared two American and two British alkali export associations and twelve alkali-producing companies guilty of conspiring to fix and stabilise prices of alkali products in restraint of trade. The final decision now rendered ends a Government suit which was initiated in 1944.

Annulling the cartel agreements under which the defendant companies were alleged to have operated, the court's judgment also enjoins the defendants from agreeing or conspiring to limit or restrict the kinds, quantities or qualities of alkalis to be manufactured, distributed or sold in the United States; to allocate customers or divide territories or markets for alkalis; to limit or withhold supplies of alkalis from any market or third person; to exclude United States manufacturer, distributor or dealer in alkalis from any market; or to limit, restrict or prevent imports into or exports from the United States of alkalis.

The alkali products involved in the case were: Soda ash, caustic soda, and bicarbonate of soda.

The export associations and companies now permanently enjoined from further restraint of domestic and foreign trade of the United States are: The United States Alkali Export Association, Inc., of New York; The California Export Association, Inc., of Los Angeles; Imperial Chemical Industries, Ltd., and Imperial Chemical Industries, Ltd., of New York.

The alkali-producing companies found guilty included: Pittsburgh Plate Glass Co., Inc.; Church and Dwight Co., Inc.; Diamond Alkali Co., Inc.; Dow Chemical Co., Inc.; Niagara Alkali Co.; Pennsylvania Salt Manufacturing Co.; Southern Alkali Corporation; Westvaco Chlorine Products Corporation; Wyandotte Chemicals Corporation; West End Chemicals Co., Inc.; Hooker Electric-Chemical Co., Inc., and Mathieson Alkali Works, Inc.

Microchemistry Group

THE seventh annual general meeting of the Microchemistry Group of the Society of Public Analysts and Other Analytical Chemists was held at the Sir John Cass College, London, E.C.3, on Friday, 26 January, when the following officers and committee members were elected:—Chairman, Cecil L. Wilson, M.Sc., Ph.D., F.R.I.C., F.I.C.I., Reader in Analytical Chemistry, The Queen's University of Belfast; vice-chairman, A. M. Ward, D.Sc., Ph.D., F.R.I.C., Principal, The Sir John Cass College; members of committee: W. T. Chambers, B.Sc., Ph.D., A.R.I.C., British Rubber Producers' Research Association, Welwyn Garden City; J. G. A. Griffiths, B.A., Ph.D., F.R.I.C., Principal Scientific Officer, Scientific Civil Service, G. F. Hodsman, B.Sc., Ph.D., A.Inst.P., Head of Research Department, Messrs. L. Oertling, Ltd.; G. H. Osborn, F.R.I.C., Chief Analyst, B.D.H., Ltd., Laboratory Chemicals Group, Poole, Dorset.

The hon. secretary, D. F. Phillips, A.R.I.C., the hon. treasurer, G. Ingram, and two members of the committee, R. F. Milton, B.Sc., F.R.I.C., and J. Sandilands, Ph.D., F.R.I.C., A.H.-W.C., continue in office.

After an interval for tea a symposium on "Radiochemical Techniques in Microchemistry" was presented by members of the staff of The Atomic Energy Research Establishment, Harwell, at which the following papers were read: "The Quartz Ultra-microbalance in Radiochemistry," by Dr. J. K. Dawson; "Micro-manipulation of Radio-active Gases," by Dr. W. J. Arrol; "The Determination of Trace Quantities of Elements by Radio-activation," by Mr. A. A. Smales.

An exhibition of apparatus was arranged by R. F. Milton and D. W. Wilson.

Rapid Growth Likely to Continue

C.I.L. Chairman Reviews Canadian Developments in 1950

A SIGNIFICANT feature of the year 1950 was the strengthening of the belief that the rapid growth of the chemical industry during the past two decades is likely to continue for a number of years to come, Mr. George H. Huggett, chairman and president of Canadian Industries, Ltd., stated in a New Year's review.

Further Increase in Demand

There was a further increase in the demand for chemicals (he said) and this trend was particularly marked during the second half of the year. Although the estimated volume of new construction was slightly lower than in 1949, the current rate of expansion has been exceeded in only a few exceptional years. Nevertheless, the Canadian chemical industry continued to concentrate on long-range problems and on the preparation involved in the large undertaking discernible for the immediate future.

The rise in production which had tended to slow down in 1949 was more rapid during 1950 and it is estimated that the selling value of the output will exceed by over 10 per cent the total of $595,000,000 reported by the Dominion Bureau of Statistics for the preceding year. There was a moderate increase in employment and the total of 44,400 persons employed by the industry at the beginning of September was 600 higher than in the preceding year.

The decline in the export of chemical and allied products during the two preceding years was reversed in 1950 and the value of goods shipped abroad was 35 per cent higher than in 1949. A point of interest is that this increase was largely the result of greater sales to the United States, owing to Canadian chemical producers being able to supply certain shortages which made their appearance in that country.

The amount expended on plants, buildings and equipment since 1945 exceeds the total investment in the industry ten years ago. Even after allowing for the high cost of construction in the post-war years, the increase in plant capacity has been remarkable. According to estimates released by the Department of Trade and Commerce the volume of new construction during 1950, amounting to $10,700,000, was slightly lower than in 1949, but additions to plant capacity in 1950 and the work in progress at the end of the year were very considerable.

Mention of some of the major undertakings during 1950 will serve to indicate the direction and scope of new capital investment. A project at Ville La Salle, a Montreal suburb, will provide for the manufacture of butylated melamine, urea and polyvinyl chloride resins, as well as expanded facilities for the production of liquid phenolic and urea resin adhesives. A large plant is being erected in British Columbia for the production of high alpha cellulose. In Alberta, a new commercial explosives plant will utilise for the first time on this continent a continuous nitrating process. In addition to the adoption of technological improvements, much new capital investment was required to enlarge or to replace existing plants engaged in the manufacture of established basic chemicals. During 1950, for example, facilities for the production of synthetic rubber, calcium chloride, carbon dioxide and insecticides were expanded in response to increasing demand.

Production of polythene tubing and sheeting was begun in 1950 and additional capacity was provided for the manufacture of Cellophane cellulose film. Considerable interest during the past year was centred on the increased quantity and variety of petroleum gases made available through greater refining capaciy and improvements in refining methods. These by-product gases serve as raw materials for many chemical products. Already additional plant is being erected for the manufacture of several important solvents such as perchlorethylene, trichlorethylene and carbon tetrachloride.

Even Wider Range Possible

Even more significant than the actual projects undertaken, from the long-range viewpoint, are the possibilities of Canadian production of a much wider range of chemicals. The expansion which such possibilities imply is dependent upon the availability of technical and scientific knowledge, trained personnel and large amounts of capital. In 1949, chemical plants in Canada numbered about 1000 and their average output for the year was less than $600,000. Moreover, the largest Canadian companies are small when compared with long established foreign producers who have had the advantage of extensive domestic markets.

Progress During 1950

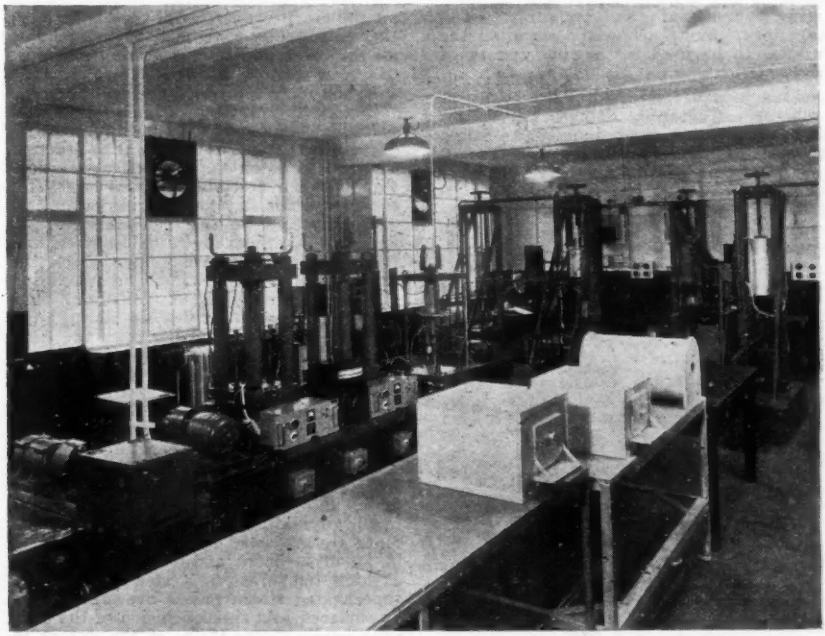
Aspects of Work at BTH Research Laboratories

THE work of the British Thomson-Houston research laboratory provides assistance to the company's design engineers and factories and initiates search for new materials and processes. This work is carried out in a number of sections, each of which is chiefly devoted to a specific field such as physics or insulations, but which overlap as the attack on a subject opens up problems of interest to specialists in the different spheres.

The investigations and developments to be described give an indication of some of the laboratory's activities.

Work on the properties of magnetic sheet steel has been continued. This involves a study of electrical and magnetic properties and their dependence on chemical composition, crystal size and crystal orientation. Progress has been made in the methods used for determining crystal orientation in sheet steel; both optical and X-ray diffraction methods have been developed further, and firmly established as useful tools for the examination of sheet samples. The method of carbon determination has been used effectively for examining both commercial samples and samples of sheet prepared in the laboratory. New equipment has been set up for the treatment and annealing of laboratory samples of sheet steel.

It has been found possible to reduce the carbon content of silicon-iron sheet from 0.03 to 0.005 per cent in a short time, and by suitable annealing treatment to develop crystals of large size (up to several inches long) with a corresponding improvement in magnetic properties. Other apparatus built during 1950 has been a miniature



Thermostatically-controlled room at the BTH Laboratories, with creep and fatigue testing machines

Lloyd-Fisher test set for the determination of watts loss in samples of size 25 cm. by 3 cm., produced by the laboratory rolling, processing and annealing equipment. There has been built up an induction furnace designed to operate under vacuum conditions, or with controlled atmospheres of high or low pressure and suitable for the melting of small metal ingots.

Induction Furnace

Power for this induction furnace is obtained from a BTH high frequency generator, rated at 10 kW and approximately 400,000 cycles/sec. The vacuum system itself comprises a vacuum chamber (consisting of a silica tube 4 in. in diameter and 20 in. long) connected to an oil diffusion pump rated at 400 litres/sec., with baffle valve, and associated equipment. A Pirani gauge with platinum filament is used to measure the fluctuating pressures in the chamber over a range from 2 mm. to 1 micron. The apparatus has been designed for the heating of small charges of material, either metallic or non-metallic, and in atmospheres of widely differing compositions and pressures. The flexibility thus achieved permits the furnace to be used for a wide variety of investigations.

Physical Analysis

The spectrographic and X-ray diffraction analysis service continues to be called upon with increasing frequency. One of the important results recently obtained from these analyses is the spectrographic identification of titanium as the impurity in sand, causing poor ultraviolet transmission in glass made from it. Hitherto it had been thought that iron was the impurity responsible for this defect.

Production model of a mass spectrometer leak detector

While numerous analyses have involved X-ray diffraction for the identification of the crystalline phases present, the most important and interesting applications of this technique recently have been in the fields of crystal orientation and texture (*i.e.*, the distribution of grain orientation in polycrystalline material). Work with the Geiger-counter and goniometer has been continued, and this method of determining crystal orientation has been further developed, being applied to silicon-iron sheet, and also to samples of germanium and tungsten, containing crystals large enough to be studied individually.

A new X-ray diffraction apparatus has been developed for texture studies, known as a " texture mapping camera."

Mechanical Testing

In order to concentrate more attention on the creep properties of metals, a large thermostatically-controlled room to house all the creep and fatigue testing machines has been set up. Steels that are specially designed for creep resistance are " precipitation hardened " by carbides and intermetallic compounds. By means of creep experiments performed at different stresses, work on the theoretical relationship between creep strain and stress for such materials is being carried out.

Blading and bolting materials for gas and steam turbines are tested at stress and temperature conditions under which the components will operate. The relaxation property of molybdenum-vanadium steel has been determined by simulating the daily stress cycle resulting from the cooling and reheating of the turbine.

An apparatus has been constructed for examining high temperature steam corrosion of metals. Good corrosion resistance must be complementary, to creep resistance in steam turbines operating at higher temperatures, and it is desirable that the scale formed should be adherent to the metal and thus help to protect it from further oxidation. Small cylindrical specimens are subjected to heating and cooling in an atmosphere of nitrogen, and while at high temperature, a steady stream of superheated steam passes over the metallic surfaces. At the conclusion of the test, measurements are made of the extent of corrosion and the degree of adherance of the oxide scale.

Examination of test welds has resulted

in a satisfactory procedure for the welding of gas turbine rotor forgings. Further work has been carried out on the metallography of austenitic steel weld metals used for this purpose, with particular reference to the formation of sigma phase and hot cracking. An etching technique for positive identification of sigma phase has been developed.

An interesting investigation is being carried out on the welding of "Nilo K," an alloy suitable for sealing to hard glass. The problems investigated were:—

1. Arc Welding of "Nilo K" to "Nilo K" and to mild steel.
2. Flash butt welding of "Nilo K."

As a result of this work the initial difficulties met with in these processes have been overcome.

In the constant search for new and improved insulating materials, some special attention has been given to the possibilities of synthetic rubber, solventless varnishes, and bitumen bonded micafolium for stator coil insulation.

Nitrile Rubber Promising

A gasket material for oil-tight joints for transformers, which can be used repeatedly and is resistant to transformer oil, has long been a requirement in transformer manufacture, and promising results have been obtained with nitrile rubber; long term ageing tests have been put in hand to confirm preliminary laboratory investigations.

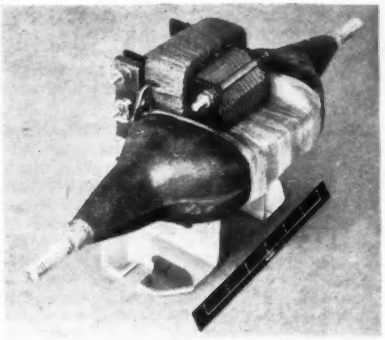
Another application of synthetic rubber is in the insulation of high voltage current transformers. This material—a mixture of polyisobutylene and isoprene—has been used for a moulded covering for current transformer coils instead of the standard method of taping with high quality varnished cloth tapes. Several of these coils have now been moulded, and have satisfactorily withstood the high voltage tests.

Solventless varnish impregnation, with the consequent elimination of voids due to the evaporation of solvents, has been successfully applied to aircraft magneto coils, and a casting resin has been used for the production of crystal rectifiers with moulded bodies.

Experiments are proceeding in collaboration with the Micanite and Insulators Co., Ltd., in connection with bitumen stickers for the development of a bitumen bonded micafolium for application to generator stator coils.

Projection Television

The laboratory has been studying phosphors for television cathode-ray projection tubes. In the course of this work two experimental equipments were made with which to demonstrate the production of large pictures by optical projection from a small high intensity cathode-ray tube.



A current transformer moulded with butyl rubber

Plastic reflecting optical systems of the Schmidt type having 11 in. diameter mirrors are used in each equipment to project the small picture on to the back projection screen. The convenience of cabinet form is achieved by folding the optical path by means of a front-surfaced mirror.

The first models of the "production type" of mass spectrometer leak detector instrument have been completed, and are proving their value.

The production type instrument was demonstrated at the Physical Society's Exhibition in April, and at the Institute of Physics' Conference on Vacuum Physics at Birmingham in June.

The growing demand for a cheaper germanium crystal diode, to replace the thermionic and metal rectifier types, has led to the development of a type using a thermosetting plastic material to enclose the crystal and catswhisker.

B.T.H. silicon mixer crystals and germanium rectifier crystals were used in the micro-wave cross-channel link in the relay of television pictures from Calais in the summer.

Lamp and Lighting Research

An interesting example of a painstaking secondary development necessary to further a main line of research is the development of an alternative seal through quartz, capable of passing larger currents. A new pressed molybdenum cup seal has been developed, enabling large diameter rods of metal to be sealed through a fused silicon bulb without the hermetic portion

of the seal carrying the current, as it does with the more conventional strip foil seal. The two metal rods are platinum brazed on either side of the centre of the molybdenum cup, the feather edge of which acts as the sealing point.

In addition to forming an alternative seal for the 5-kW and allied mercury cadmium projector sources which have had an extended field use during the year, this seal is particularly useful for the development work endeavouring to produce a practical light source out of the high pressure xenon discharge. These xenon discharges have low voltage drops for projector type light sources, and currents up to 180 amperes have been tried from the point of view of obtaining high brightness high power lamps. An interesting 2½-kW lamp has been made in which the cup type of seal helps to reduce lead losses and, by using a gas filling pressure of about two atmospheres, a luminous efficiency of 33 L/W of good colour light has been obtained. Research is continuing, particularly in connection with cathodes for large currents, and in methods of simplifying the operation of these sources.

The light source required for Raman spectroscopy defines that this should give a high intensity of a particular line radiation with little background continuum. A mercury lamp, giving a high intensity of 4358 A° radiation, has been developed for Raman spectroscopy using the arc tube of a 400-watt type MA lamp but with a reduced mercury vapour pressure to obtain the maximum differential in line to background intensity.

Aureomycin in the U.K.

Refining Commenced at Hirwaun

THE refining of aureomycin has just been started at Hirwaun, near Cardiff, in South Wales. The drug will be purified and capsuled from intermediates which have been produced by fermentation at the Lederle Laboratories Division of the American Cyanamid Company in the U.S.

Aureomycin, discovered by Dr. Benjamin Duggar at the Lederle Research Laboratories, is an antibiotic of great versatility. During the past three years extensive clinical experence in the U.S. and many parts of the world have shown that it is effective against a wide variety of infectious diseases.

Its value lies chiefly in its powerful specific action in diseases not heretofore reached by other antibiotics, its low toxicity and ease of administration. In most cases the drug is administered orally.

The list of diseases against which aureomycin is proving effective is constantly growing. A few of those infections for which it is already indicated, includes brucellosis, commonly called "undulant fever," which frequently affects people in rural areas. The disease can be transmitted by drinking milk which has not been pasteurised, or by handling infected animals. Other diseases cured or shortened by aureomycin are primary atypical pneumonia, sometimes called "virus-pneumonia," sinusitis, and, when it is resistant to penicillin, bacterial endocarditis (an infectious heart disease).

A number of eye infections can be successfully treated by aureomycin, the most spectacular result being obtained in trachoma. This disease is widespread in the Middle East and Asia, and in its final stages causes blindness. It is also effective against the general group of infections caused by streptococci, staphylococci and pneumococci, as well as a group of rare tropical diseases such as African tick bite fever, typhus and amoebic dysentery.

Both the Board of Trade and the Ministry of Health have been helpful in bringing the manufacture of this drug to England. The factory at Wales has the capacity to supply all the expected needs of the United Kingdom as well as a considerable quantity for export.

International Code Sought

NINE countries were represented at Geneva in a series of talks which began on 22 January under the auspices of the United Nations Economic Commission for Europe (ECE) in an effort to develop international codes for the safe transport and handling of dangerous goods.

A draft convention on the transport of dangerous goods by road was considered by the ECE working party. Although based on experience in rail transport, the draft takes into account special conditions of packing, labelling and loading, as well as problems of vehicle construction, required to ensure safety in road transport.

In the discussion on inland waterways, the transport of explosives was given special priority at the request of the Central Commission on the Navigation of the Rhine.

The need for special safety measures in handling dangerous goods right through from the approach of a dangerous cargo to a sea or river port, through various stages to its departure from the port area, were also discussed.

Stains for Microscopy

Britain's Role in Highly Specialised Field

STAINS and reagents for microscopy are in world-wide demand and there are few countries to which they are not being exported. So rapidly has consumption expanded since the war that British manufacturers find it increasingly difficult to keep pace with the ever-growing volume of orders. The expanding demand is attributed largely to the progress of civilisation itself. Living standards are rising in many countries. More hospitals are being established and training in medical schools is becoming increasingly advanced. Larger quantities of stains are required for research purposes, notably in the field of medicine.

The production of stains for microscopy is a highly specialised field and might be termed one of Britain's smallest industries. Although individual consumption is not normally large, a wide range of stains is required by a large number of users. This, coupled with the heavier and constant demand for certain special-purpose stains (*e.g.*, stains used in routine examinations for tuberculosis), means that the aggregate requirements amount to many tons annually. The British products are fully competitive in price and dollar difficulties have enhanced the importance of this thriving industry to users both at home and overseas

Dates Back to 1770

The use of stains in microscopy goes back to 1770, when J. Hill used a tincture of cochineal in studying the structure of timber. Another important step forward was made in 1838, when Ehrenburg made use of powdered indigo and carmine in an attempt to trace the digestive system of certain microscopic organisms. Haemotoxylin was first manufactured in 1840, while madder or natural alizarin has been used since 1849. It is noteworthy that two of these early natural dyestuffs, carmine and haematoxylin, are still very valuable to microscopists. Madder has also retained its importance, but the natural substance is now supplanted by the production of artificial alizarin.

Since Goppert and Cohen first made use of madder for their botanical studies, the production of stains for microscopical studies has developed into an industry of basic importance to medicine and research. From 300 to 400 dyes are used in microscopy, some of which were first developed as textile dyes but are now manufactured solely as microscopical stains. Firms specialising in this field are also called upon to supply an almost infinite variety of solutions, though there are, of course, certain recognised formulae for which a regular demand exists.

Before the first world war Germany was the leading producer of stains for microscopy and Britain's entire requirements were imported. Prominently associated with the establishment and development of the industry in this country was George T. Gurr. During the 1914-18 war, when supplies of certain special stains became difficult or impossible to obtain, Mr. Gurr succeeded in preparing Leishman's stain to a high enough standard for the requirements of the British Army.

Led to Firm's Founding

Other work, notably on azures—a series of oxidation products of methylene blue—and Giemsa stain, was also carried out, and eventually led to the foundation of the firm of George T. Gurr, which to-day supplies stains to countries throughout the world. During the recent war, Mr. Gurr succeeded in producing a synthetic orcein, which has become the routine stain for elastic fibres in general pathology, and is one of the war substitutes which has proved better than the original (the natural orcein).

Other manufacturers have since come into the field and the industry is playing a significant part in the export drive. Its importance as an export industry far exceeds the cash value of the consignments sent abroad, for in many instances shipments of stains to remote markets have brought orders for allied materials (*e.g.*, fine chemicals) to other British manufacturers.

The basic applications for dyes in microscopy are for staining tissues and microorganisms. Normally these substances are colourless and difficult to see under the microscope. The use of stains makes possible the detection and recognition of the components, either by appearance, that is shape and size, or by particular staining characteristics.

Special dyes are also made for estimating the human blood volume. A small quantity of the dye in solution is injected into the subject. After the blood has been

allowed to circulate for a few minutes serum is taken and compared with a sample of serum containing dyes of known strength. This method is valuable in the treatment of such diseases as leucaemia.

Besides making the cell structure and organisms visible under the microscope and enabling variations in their structure to be observed, stains, by their selective action, which is sometimes specific, may be used to reveal the chemical nature of the specimen or, in bacteriology, to detect and record the growth of organisms.

The Romanowsky Group

An instance of specific or selective staining of great importance is the well-known Romanowsky group of stains based on eosin, methylene blue, and the azures. Many modifications of this group have been introduced and developed by investigators throughout the world. These are all based on the principle of selective three-colour staining. In other procedures acid and basic dyes or their compounds are used together to produce selective multi-coloured stains. Staining with many colours can also be done by completely separate processes.

The mechanism of selective staining has yet to be conclusively established. It can be accounted for chemically to some extent, the chemical theory being that the stains actually combine with the tissues or organisms. Thus a basic stain will combine with an acid molecule in the tissue or with the nuclei containing nucleic acid. Similarly, acid dyes will combine with cytoplasm, which contains basic material. But assuming that chemical salts are formed by reaction between the dye and the tissue, how is it that the dyes can be washed out again after use? Chemical combination may possibly take place superficially, and in some instances this does occur, but it seems evident that the chemical theory does not supply a complete explanation of the phenomenon.

Some investigators consider that selective staining is essentially a physical process. They maintain that staining is due to penetraton of the dye into the substance, which may take place in three different ways. In the first place most substances are porous; secondly, the stain may penetrate certain elements by absorption and remain in a state of solid solution; thirdly, it has been shown that basic dyes can stain by adsorption such substances as kaolin, talc, etc. Some of the adsorbed dyes cannot readily be removed by boiling alcohol. This property of adsorption is made use of in dyestuff analysis for the separation of dyes, the material most commonly employed for this purpose being kaolin.

Though the nature of the staining reaction may not be fully understood, technological progress in its applications is extremely rapid. New dyes and new applications for existing dyes are constantly being introduced.

Of great importance to bacteriologists is the development of a new staining technique based on the Feulgen reaction, this reaction being a test for deoxyribose nucleic acid preceded by hydrolysis to remove the stainable outer layer of the cells. While the Feulgen solution gives a good picture of the nuclear structure, it was subsequently discovered that the picture could be greatly improved by staining the preparation after hydrolysis with Giemsa.

Known as the acid-Giemsa method, this process overcomes the disadvantages of the staining methods formerly employed for identifying bacteria and examining their internal morphology. The new technique is to make smears and fix them in alcohol or osmic vapour, hydrolyse in normal hydrochloric acid for 10 to 20 minutes at about 60°C., and then stain in dilute Giemsa for 30 minutes at about 37°C.

Among other recent introductions are the new stains associated with Lendrum and the development of excellent substitutive stains in the Mallory series, such as Lissamine red and Celestine blue.

The Fluorescent Series

Reference may also be made to an interesting group of stains in the fluorescent series, which are by no means novel but are becoming increasingly important. These dyes, which fluoresce under ultra-violet light, present interesting possibilities which have not yet been fully explored.

Microscopists sometimes blame the stain when unsatisfactory results are achieved in practice. The vast majority of failures, however, are due not to a faulty stain but to defects in the staining technique employed. The trouble can frequently be traced to the *p*H of the distilled water used, the quality of the alcohols, or the fixatives used in some materials. In one instance, much trouble caused to the manufacturer, merchant and user was finally traced to the presence of tin in solution in a container which had been cleaned out with acid and happened to contain a minute quantity of the metal.

Hydrogen ion concentration plays a very important part in staining. A thionin solution which would not stain plague in an hour did the job satisfactorily in half

a minute or less after the *p*H had been suitably adjusted. It does not seem to be generally known that the *p*H of distilled water as it runs from the still can be changed at will.

When Leishman's stain, one of the Romanowsky stains previously mentioned, is used for clinical work on blood, it is necessary to adjust the reaction of the distilled water to approximately *p*H 6.8, at which point it will show pink erythrocytes, purple nuclei and typically stained granules. For diagnosing malaria, however, it is preferable to use distilled water at *p*H 7.2, giving grey blue erythrocytes which contrast with the red parasites they contain. Mr. Gurr recommends ordinary London tap water instead of distilled water for making up solutions of such stains as eosin, erythrosin, phloxine and Rose Bengal.

Modification Called For

Variations in the strengths of solutions call for modifications of the staining technique. A satisfactory method of obtaining stains which are difficult to dissolve is to add an excess of silver sand and triturate. Saturated solutions of dry stains should be avoided, particularly where aqueous solutions are concerned. If a strong solution is required, a definite percentage strength should be adopted, which is within the known limit of solubility of the dye. Even if the dye is a pure substance the strength of a saturated solution will vary with temperature.

Aniline and phenol may be added to increase the intensity of stains and are known as accelerators. The mechanism of their action is not understood, but it is possible that they may be catalysts or that they form less soluble salts of the dye. Acids are sometimes used for a similar purpose with acid stains and alkalis with basic stains. In order to slow down the staining process salts may be added to basic stain solutions. Glycerin can also be used in the same manner, its addition resulting in slower and more even staining. Salicylic acid, arsenic, and various other substances may be added as preservatives.

Closely associated with progress in staining techniques is the development of improved methods of preparing specimens for microscopic examination. Paraffin wax is used in very large quantities for the embedding process, after which tissues, plant materials and other substances may be cut into very thin sections for examination. This is achieved by embedding the sample in wax and slicing the section under a microtome. By this means sections as thin as 1 μ can be prepared, although 5-10 μ is more normal. Since tissues are normally aqueous the process involves dehydration, which is accomplished by a series of saturations of the specimen in alcohols and wax miscible solvents. The specimen is finally placed in molten wax and after a period of infiltration the wax is allowed to harden and the specimen is cut out into a block for mounting on the microtome. As an adjunct to paraffin wax a water soluble embedding wax was introduced by Gurr a few years ago and is now being marketed on an increasing scale.

As producers of a range of dyes for specialised purposes, it is not surprising that the manufacturers of microscopical stains receive inquiries for dyes for other uncommon uses. These have included fluorescent dyes—normally colourless, but brilliantly coloured in ultra-violet light—for the detection of pickpockets, dyes for flies for fishermen, and dyes for golf balls. More normal non-microscopic applications for stains are the use of haematoxylin in the examination of boiler feed waters, and of other dyes in analytical or photographic work for light filters or test reagents.

First of Series Available

THE first three of a series of organic sulphonyl fluorides are now being made available in experimental quantities for evaluation purposes by the Pennsylvania Salt Manufacturing Company, Philadelphia, Pa. They are benzenesulphonyl fluoride, *p*-chlorobenzensulphonyl fluoride, and m-nitrobenzenesulphonyl fluoride. These fluorides are a class of chemical compounds hitherto not available for commercial exploitation. Their chemical properties and stability differ sharply from those of the analogous sulphonyl chlorides. The sulphonyl fluorides are thermally stable and are resistant to hydrolysis, chlorination, oxidation and elevated temperatures. They show an unusually wide range of solvent properties. In view of these and other characteristics they are recommended for evaluation as solvents, as heat transfer agents, as intermediates in the manufacture of dyestuffs, and as chlorination media.

Cinchona Exports Trebled

Cinchona exports from the Belgian Congo aggregated 748 tons valued at 29m Belgian Congo francs for the first half of last year. This represents an increase of more than 300 per cent over the corresponding period of 1949.

Power and Production

Festival Tribute to Industry

THE story of British manufacturing industry, from the raw materials to the finished product, will be featured in the Power and Production pavilion of the South Bank Exhibition during the Festival of Britain from 4 May to 30 September. The building, situated on the western fringe of the site, will form part of the sequence of displays illustrating the resources of Britain and the way in which they have been developed.

Harnessing of power has really been the key to Britain's industrial strength, and the first exhibit will show how mechanical energy is obtained through steam from coal. Models will illustrate the generation of electric power and its transmission by the National Grid.

The story of metals, their preparation and manifold applications will follow. The four main processes—rolling, forging, extrusion, and casting will be demonstrated.

Factors governing the location of certain types of industries in particular areas will next be explained.

Research as an aid to discovery, a source of improvement in products and manufacture, will be described with reference to four industries—dyestuffs, footwear, metals and flour.

The dyestuffs display will show how a pigment is produced and the dyed materials tested in every conceivable condition likely to be encountered in use.

Research in metals will be mainly concerned with the development in Britain of magnesium-zirconium alloys which are now used in the manufacture of gas turbines. Among the specimens of metal research instruments on view will be machines for creep-testing and notch-testing.

Maintenance of Quality

How quality in manufacture is maintained by the routine testing of raw materials, components and finished products will next be seen. Items will include equipment for testing the strength of cotton yarn, the viscosity of oil, and the amount of moisture in timber.

The story of British industries will be told in a series of six displays which include rubber and plastics, glass, and textiles.

Development of rubber will be traced from the early British inventors—Hancock, Mackintosh and Dunlop—to the present day processes of curing, masticating, compounding and vulcanisation. Callendering, extrusion and moulding will all take their place and a varied collection of rubber products will be exhibited.

The plastics section will show the transformation into finished products of five primary materials:—the moulding powders of phenol-formaldehyde, urea-formaldehyde and cellulose acetate; and the styrene and acrylic granules. Visitors will be able to see how flexible sheeting, laminated plastics, fabricated thermoplastics and moulded plastics are made.

After an historical introduction the glass display will be illustrated by panels depicting mouth blowing, hand pressing, automatic blowing and pressing, automatic drawing and rolling, cast and sawn optical glass, and glass cutting and decorating.

In textiles, the achievements of some pioneer inventors of textile machinery will be followed by the evolution of different fabrics from natural and synthetic fibres.

'High Vacuum' Address

THE important rôle which the production of high vacuum had played in the growth of modern atomic physics was emphasised by Professor E. N. da C. Andrade, F.R.S., in his address on "High Vacuum," delivered to the Royal Institution, London, last week.

By a high vacuum was meant that so little air, or other gas, was left in a vessel that the pressure was about a millionth of atmospheric or less.

The cylinder pump was no longer used for producing a rough vacuum. Instead was a pump in which a space was alternatively opened and closed by rotation of a specially devised shaft. This required the use of special oils.

Speedy and easy production of very high vacua, however, depended on pumps based on an entirely new principle developed after the first world war. In this system a rushing stream of mercury vapour or oil vapour entangled the atoms of gas and carried them away.

Electronic valves and cathode-ray tubes were examples of the need for high vacua in electronic devices. In these the number of molecules of gas had to be kept, relatively, very low in order to give the electrons free run.

In a similar way in the great cyclotrons used in atomic research the pressure must be kept very low in order to get very swift particles.

For the new 3,000 m. electron-volt accelerators now being planned at Brookhaven, U.S.A., there will be 12 pumping stations, each including a 20-in. oil vapour-steam pump.

The Truth About Pentachlorophenol

IN an article entitled "New Fungicides for Leather" appearing in THE CHEMICAL AGE of 23 December (page 875) mention was made of sodium pentachlorophenate, whereas the physical properties given were those of pentachlorophenol. Sodium pentachlorophenate as usually supplied is a fine buff powder which is freely soluble in water, comparatively odourless and non-volatile. Pentachlorophenol, however, is a greyish flakey substance and has a slight chlorophenolic odour which is not usually apparent when incorporated at the concentration required for preservation. It is practically insoluble in water, has a crystallising point of 174° and is relatively inert and very stable.

The article mentioned did not give any details of the effects of sodium pentachlorophenate on humans established after extensive tests by toxicologists and dermatologists. Since this substance is now being widely used in industry the following information might prove of value and interest:—

Since no cases of fatal poisoning have been recorded, no direct figures are available for the minimum lethal dose of pentachlorophenol or its sodium salt for man, but prolonged toxicological studies on experimental animals have shown that it is less toxic than such commonly used chemicals as strong ammonia solution, benzene and household disinfectants of the Lysol type.

Minimum Lethal Doses

Pentachlorophenol and sodium pentachlorophenate in single administrations, orally, cutaneously, subcutaneously or intravenously, will, if sufficiently large doses are employed, produce death of experimental animals. The minimum lethal doses are as follows:—

Rabbits

Oral Administration

Sodium pentachlorophenate in water—250-300 mg/kilo of body weight.

Pentachlorophenol dissolved in olive oil—100-130 mg/kilo of body weight.

Pentachlorophenol dissolved in Stanolex fuel oil—70-90 mg/kilo of body weight.

Cutaneous Administration

Sodium pentachlorophenate in water—250 mg/kilo of body weight.

Pentachlorophenol dissolved in fuel oil—60-170 mg/kilo of body weight.

Pentachlorophenol dissolved in pine oil—40-50 mg/kilo of body weight.

Subcutaneous Administration

Sodium pentachlorophenate in water—100 mg/kilo of body weight.

Pentachlorophenol dissolved in olive oil—70-85 mg/kilo of body weight.

Intravenous Administration

Sodium pentachlorophenate in water—22-23 mg/kilo of body weight.

Rats

Oral Administration (L.D. = 50 dosage killing 50 per cent of test animals)

Sodium pentachlorophenate in water—210.6 mg/kilo of body weight.

Pentachlorophenol in Stanolex fuel oil—27.3 mg/kilo of body weight.

Pentachlorophenol in olive oil—77.9 mg/kilo of body weight.

Subcutaneous Administration

Sodium pentachlorophenate in water—66.3 mg/kilo of body weight.

Physical Characteristics

The physical picture before death of test animals is one of acute toxemia characterised by increased blood pressure, hyperpyrexia, hyperglycemia and glycosuria, hyperperistalsis and an increased and later a diminished urinary output and rapidly developing motor weakness, complete collapse and asphyxial convulsions.

Toxicology data was obtained by Dr. R. A. Kehoe (*J. Ind. Hyg.*, 1939, 21, 160-72); W. Deichmann (*J. Pharmacol. Exp. Therapeutics*, 1942, 76, No. 2, 104-17); W. Machle (*J. Ind. Hyg.*, 1943, 25, 192-4); J. Grindon (*Dermatologist*, St. Louis, Missouri, U.S.A., unpublished works) and others who found no evidence of cumulative poisoning effects either by pentachlorophenol or its sodium salt administered either orally or cutaneously.

Repeated cutaneous applications of pentachlorophenol dissolved in fuel oils and sodium pentachlorophenate in water have been made to rabbits using doses varying from 10 per cent to 46 per cent of the known lethal values at each application. The number of applications varied from 2 to 120 and the duration of the treatment from 2 days to 60 weeks. Of four rabbits receiving doses of pentachlorophenol in fuel oil equal to 10 per cent of lethal, only two died, one of these after biweekly applications for 47 weeks and the other after biweekly application continued for 60 weeks. Of seven rabbits receiving weekly applications of pentachlorophenol in fuel oil in doses 46 per cent lethal, only three died. Of the four that

lived, one had received 47 treatments and another 42.

On 32 successive days a rabbit was given a dose of 63 mg/kilo of sodium pentachlorophenate as a 2 per cent solution. At no time did this animal show illness or injury to the skin. This dose is 63/250 or 25 per cent of lethal.

Six rabbits received doses of 1 per cent sodium pentachlorophenate solution representing 40 mg. per kg. for 100 consecutive days (excluding Sundays). This dosage is 40/250 or 16 per cent of lethal. The gain in body weight was normal; there were no fatalities; the treated areas occasionally showed mild irritation, but no wrinkling or cracking of the skin and no loss of hair.

Feeding Experiments

Feeding experiments were conducted on rats and cats over periods of from 10 to 28 weeks incorporating pentachlorophenol in their food in amounts of from 3.9 mg. to 10.0 mg. per animal per day.

Based on the values reported for single lethal doses under these conditions, the quantities of pentachlorophenol fed each day represented about 1 per cent of the minimum lethal dose for the cats and 41 per cent of the minimum lethal dose in the case of the rats. The chemical apparently rendered the food distasteful and the animals did not gain weight at the normal rate during the test period. However, there were no fatalities and no illness nor other signs of poisoning. Post-mortem examinations made on tissues of the rats revealed no gross and only insignificant histological abnormalities. It would appear, therefore, that there were no cumulative effects produced in these animals by the daily ingestion of pentachlorophenol in the sub-lethal amounts stated.

The toxicity of pentachlorophenol to fish is of interest when its use may in some direct or indirect way cause fish-bearing streams or lakes to become contaminated with the chemical. Dr. C. J. Goodnight, University of Illinois, has conducted extensive research studies to evaluate the possible hazard to fish life arising from such pollution. The following is quoted from the summary of Dr. Goodnight's publication on this work, " Toxicity of Sodium Pentachlorophenate and Pentachlorophenol to Fish," *Industrial and Engineering Chemistry*, Vol. 34, p. 868, July, 1942:

" Pentachlorophenol and sodium pentachlorophenate are fatal to the more sensitive species of fish in concentrations above 0.2 p.p.m. although hardier species will survive at 0.4 or 0.6 p.p.m. In lethal concentrations they increase the metabolism of fish as evidenced by increased respiratory movements; bleeding results from capillary rupture. Silver-mouthed minnows are the most sensitive of the fish used in the experiments.

" The toxicity of pentachlorophenol and sodium pentachlorophenate to fish is increased by lowering the *p*H of the water. Within reasonable limits the size of the fish, the temperature of the water, and its character do not greatly affect the toxicity of the compounds. The number of fish in a solution of given volume does not affect their survival time. Above 10 p.p.m. fish can detect the presence of sodium pentachlorophenate, but not below 5.0 p.p.m.

" Eggs of lake trout are very resistant to these compounds. Lake trout are most sensitive to pentachlorophenol in the yolk sac stage immediately after hatching.

" Invertebrates such as are used by fish as food are relatively insensitive to pentachlorophenol and sodium pentachlorophenate. The most sensitive invertebrates will live at concentrations at which fish will survive."

Although strong solutions of pentachlorophenol or sodium pentachlorophenate can cause local irritation of the skin of sensitive individuals if prolonged contact is allowed, the low concentration of the preservative in treated goods does not cause skin irritation.

No Irritation Resulted

Leather and rubber articles containing pentachlorophenol as a preservative can be worn next to the skin without any danger or discomfort. For example, R. M. Lollar (*J. Amer. Leather Chem. Assoc.*, 1944, 39, No. 6, 203-9) has found that leather harnesses containing up to 1 per cent pentachlorophenol caused absolutely no irritation to horses or dogs when worn next to the shaved skin, and other work by J. Grindon has shown that rubber gloves containing 0.5 per cent pentachlorophenol produced no irritating or sensitising effects on the skin of women subjects. The latter also showed by a series of patch tests on women volunteers that prolonged contact (48 hours) of an 0.4 per cent solution of sodium pentachlorophenate with the skin produced no harmful or unpleasant effects.

Twenty-four new-born babies at the St. Louis City Hospital wore rubber pants containing sodium pentachlorophenate continuously for an average of nine and one-half days each. Half of these pants were pink, water-cured, chlorine-treated, water extracted and contained 0.08 per cent sodium pentachlorophenate; the other half

were white, air-cured and contained 0.32 per cent sodium pentachlorophenate. Daily observations were made to discover any signs of dermatitis, but none developed on any of the 24 babies.

Pentachlorophenol, which was first manufactured on a commercial scale by the Monsanto Chemical Co., of America, in 1936, is now being made by Monsanto Chemicals, Ltd., of Great Britain, and is marketed under the name Santophen 20. The sodium salt is marketed under the trade name of Santobrite. These products are toxic to a very wide range of micro-organisms, and practical experience in many and varied industries has shown that their low cost and desirable physical and chemical properties make them excellent industrial preservatives. Many industrial products of organic origin are subject to micro-biological attack at some stage in their manufacture or use and it is often necessary to incorporate a fungicide. Santobrite and Santophen 20 have been used for the preservation of adhesives and sizes, paints, leather, rubber latex, textiles, wood and cellulosic insulating materials.

Scottish Technical Council

London Scientific Panel Appointed

FIFTEEN Scottish scientists have agreed to be members of a London Technical Advisory Panel of the Scottish Council—Development and Industry.

So many Scottish scientists came to London, said Mr. A. W. Morrison, honorary secretary, that it had been considered opportune to set up the Scottish Panel. The London committee would meet when necessary at luncheon or dinner, but there would be no formal or regular meetings. Any scientific knowledge of use to Scotland, particularly to her industries, would be collated and reports sent to Scotland.

All members of the panel had voluntarily offered their services to help the advancement of scientific effort in their native land.

Regarding the operation of the panel, Mr. Morrison said that if, for example, an American scientist came to this country to talk about the latest development in penicillin-type mould, he would be asked to meet Sir Ian Heilbron and Sir Alexander Fleming.

It would be discovered raw materials were available and whether Scotland could provide raw materials and manufacturing facilities. High level talks at the start would assist the Scottish Council, and later there could be discussions with firms and universities.

There were now 19 U.S. factories in Scotland, stated Mr. James Maxwell, chairman of the London committee of the Scottish Council. Scotland could offer better facilities for ECA factories than other European countries. The Americans were highly satisfied with the labour, and inquiries were on hand for at least 15 new U.S. factories.

Members of the Scientific Panel were: Sir Alexander L. M'Coll, chairman, of Kilmarnock, director of the Vacuum Oil Company; Lt.-Col. S. J. M. Auld, Kilmarnock, who was a member of the War Cabinet Technical Sub-Committee; Mr. John L. P. Brodie, of Dumfries, director of the de Havilland Engine Company; Mr. A. P. Buchanan, a member of the Institution of Chemical Engineers; Mr. J. Davidson Pratt, of Drumoak, Aberdeenshire, a member of the Chemistry Research Board and Pest Intestation Research Board; Dr. Alexander Fleck, of Glasgow, chairman of Scottish Agricultural Industries, Ltd., and deputy chairman of I.C.I., Ltd.; Sir Alexander Fleming, of Darvel; Mr. T. G. N. Haldane, partner of a firm of consulting engineers, and a hydro-electric expert; Sir Ian Heilbron, of Glasgow, chairman of the Advisory Council of the Department of Scientific and Industrial Research; Dr. F. Y. Henderson, of Glasgow, director of the Forest Products Research Laboratory; Dr. Alexander King, of Glasgow, head of the Intelligence and Overseas Scientific Liaison Divisions of the D.S.I.R.; Dr. D. C. Martin, of Kirkcaldy, assistant secretary of the Royal Society; Dr. T. D. Robson, of Langholm, of the Lafarge Aluminous Cement Company, Ltd.; Sir James Scott Watson, of Angus, Chief Scientific and Agricultural Advisor, Ministry of Agriculture; and Mr. A. W. Morrison, of Castle Wemyss, Renfrewshire, manager of the chemical carbon division of Powell Duffryn Carbon Products, Ltd.

Parliamentary Committee

The following new officers were elected at the annual meeting last week of the Parliamentary and Scientific Committee: Vice-presidents: Lord Haden-Guest, Sir Wavell Wakefield, M.P., and Sir Henry Tizard; and joint deputy chairman, Mr. W. T. Wells, M.P. Among the officers re-elected were: president, Lord Samuel; chairman, Mr. M. Philips Price, M.P., vice-chairman, Sir Charles Goodeve; joint deputy chairmen, Mr. F. J. Erroll, M.P., and Mr. Raymond Blackburn; joint honorary secretaries, Mr. C. Orr-Ewing, M.P., and Dr. W. R. Wooldridge.

• OVERSEAS •

To Build Steel Plant

The New England Steel Development Corporation is going to build a steel plant at New London, Conn. The proposed open hearth plant would produce one million net tons of steel ingots annually and 700,000 net tons of mill products.

Petroleum Congress

The first South American Petroleum Congress will be held next March in Montevideo. The Congress will study the possibilities of increasing petroleum production in South America, consider methods for economising its use and review trade and interchange of fuels between South American nations.

To Make Polythene Flake

The manufacture of polythene flake to meet current shortages is likely soon to be undertaken by Canadian Industries, Ltd. The cost is expected to be between 8 and 10 million dollars. At present, all polythene flake is imported from Great Britain or the U.S.A. It will be remmebered that the company brought its polythene extrusion plant into operation at Shawinigan Falls during March last year.

Export Duty Imposed

A decree has been issued through the Argentine Ministry of Economic Affairs imposing an export duty of 5 per cent on the selling price of quebracho extract. The proceeds of the duty will be used to form a forestry fund and will be spent exclusively on the study of forestry and re-afforestation so as to ensure a permanent supply of raw material for the quebracho extract industry.

Reactivation Urged

Reactivation of German synthetic rubber plants was called for by Harvey S. Firestone, Jr., chairman of the Firestone Tyre & Rubber Company, at a meeting of the New York State Chamber of Commerce. Mr. Firestone also said that an exchange of synthetic for natural rubber with America's allies might be worked out for the mutual benefit of all. Noting that the desired results of making more synthetic rubber available abroad could be achieved by rehabilitating, under U.S. control, the synthetic plants in Germany, he said: "It seems to me particularly unfortunate that the German synthetic plant in the Russian zone has been producing at full capacity since the end of the war, while the synthetic plants in the other zones are idle."

Brazilian Oil Discovery

The Consêlho Nacional do Petroleo has issued a statement announcing the discovery of a new oilfield in the State of Bahia and adding that test drillings indicate an output of 600 barrels per day.

Agreement Signed

It is announced that an agreement between France and Italy regarding Italian use of Algerian iron ore has been signed. Italy had previously requested that the purchase of Algerian ore be admitted to the Schuman Plan. France refused but suggested the purchase agreement instead.

Magnesium Plants Reopen

The Government-owned magnesium plants at Painsville, Ohio, Canaan, Conn., and Wingdale, N.Y., will be reopened so as to make about 200 million lb. of magnesium available to the U.S. stockpile during the next two years. The plants will be operated by the Dow Chemical Company of Midland, Michigan and Freeport, Texas, while a plant at Manteca, Calif., will be operated by the Kaiser Magnesium Company, a subsidiary of Kaiser Aluminium and Chemical Corporation.

Ambitious Research Plans

Professor Sir Marcus Oliphant, world famous atom scientist, believes that by 1952 Australia could be further ahead in atomic research than any other nation. By the end of 1951 it is hoped, according to Australian sources in New York, to have established at the National University at Canberra, a cyclo-synchrotron which would give Australian scientists opportunities for atomic research equal to those anywhere in the world. The cyclo-synchrotron would be capable of producing energy particles of 2,000,000,000 volts.

To Test Zirconium Metal

Considerable amounts of zirconium metal will be produced, under contract, by the Foote Mineral Company, Philadelphia, Pa., for experimental purposes for the U.S. Atomic Energy Commission. The Foote Company has been making ductile zirconium commercially since 1942. Aside from its properties of corrosion resistance, strength and weight, zirconium has a relatively low tendency to capture neutrons and may, therefore, find new uses in atomic furnaces. Neutron capture by materials of construction in an atomic reactor has been a serious problem for metallurgists.

National Packaging Exhibition

Modern Methods Combine Appeal with Efficiency

THAT a package which appeals to the eye can also be economic and efficient was amply demonstrated at the National Packaging Exhibition, Olympia, which closed this week.

The exhibition which was the first to be held in London, was sponsored by the Institute of Packaging and was prompted by the success of a similar display held in Manchester in 1949.

With the difficulties caused by the present supply position the need to make the most of raw materials and to eliminate waste through damage in transit or deterioration in storage lends additional importance to the technicalities of packaging.

Many new ideas and new applications were on view. A development shown by J. & W. Baldwin (Manchester), Ltd., was wood wool pads suitable for packing delicate instruments.

A wide range of transparent packaging films easily laminated to other packaging materials were on view.

Some of the more important industrial uses now being found for polythene film and tubular film were displayed by I.C.I., Ltd., and demonstrations were given of modern heat sealing techniques suitable for the conversion of film into drum liners and protective packs.

Complete protection against dust and dirt is afforded by clarifoil, a cellulose acetate transparent film shown by British Celanese Limited. The film can be spirally wound to form strong transparent tubing for a variety of industrial applications.

Cellophane's Usefulness

The physical properties of Cellophane and its general usefulness as a packaging medium were demonstrated by British Cellophane Limited. A special feature was a large working model of a weight calculator designed to assist users when estimating packaging requirements.

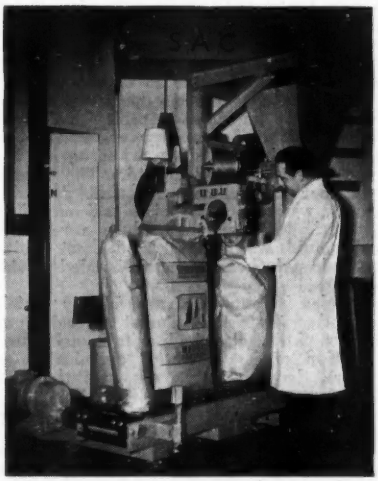
Over 100 years of experience have gone into the constant development of process technique and perfecting of plant by British Glues & Chemicals, Ltd. Cascade Pearl glue in clear amber beads of uniform size is easy to handle and free from impurities, and is a great advance on old-fashioned cake-glue which required breaking and long soaking.

Plain and wickered jars for acids, extracts, inks, and polishes for the chemical and allied industries were featured by the British Stoneware Manufacturers' Association. Stoneware composed of a vitrified body, non-porous and well glazed by means of leadless glaze is ideally useful for many industries, particularly where liquids are concerned.

Containers for chemicals, insecticides, paints, oils and greases were shown by E. A. Brough & Co., Ltd. Sizes ranged from 4 in by 5 in. to carry 7 lb. of white lead to 4-5 gallon to carry 4 cwt. grease or equivalents. Containers were offered in black steel, galvanised, tinned or internally lacquered, also for certain restricted sizes in tin, terneplate and zintec.

The wide field of work of the British Standards Institution was exemplified in samples of fibre board and metal drums, paint cans, pharmaceutical boxes, tie-on tag labels and tin foil. British Standards for packaging as well as the sections of the British Standards Packaging Code at present available could be consulted.

Extrusions and mouldings in all suitable plastic materials for a variety of trades were displayed by Cascelloid, Ltd. Other plastic packaging products included Transbosmatic transparent acetate boxes with either board or acetate base made by



The Medway Sac-sealer unit being demonstrated at Olympia

special machinery to very accurate limits; polythene lay-flat bags in sizes up to 27 in. diameter; Plax type flexible bottles.

Heat sealing and other mechanical equipment to demonstrate the qualities of Pliofilm were featured on the stand of the Goodyear Tyre & Rubber Co. (G.B.), Ltd. The display included pharmaceuticals, machine parts and other products packaged in the film.

An anti-corrosive coating in the form of a plastic-resilient film which can be stripped by hand from the coated item was displayed by Croda, Limited. The coating is novel in that it can be applied at 180° C. by dipping the parts to be coated in a bath of the material.

A full range of vacuum pumps and compressors was shown by Lacy-Hulbert & Co., Ltd.

Ingenious Bottle Washers

Various ingenious forms of bottle cleaning machines, rinsers and brushing machines were exhibited by the Thomas Hill Engineering Co. (Hull), Ltd., and an inverted air cleaning machine capable of dealing with 600 dozen containers an hour, when fed by two operators, was shown by Mecho Pack, Ltd.

Modern packages for a wide variety of products, including chemicals, fertilisers and plastic materials, were the feature of the stand of Medway Paper Sacks, Ltd. The Sac-Sealer units shown were simple in design and economic to install and operate. Nearly all types of product could be dealt with, and the seals applied to paper, jute or cotton sacks. Provided suitable weighing equipment was available to feed the automatic spout, up to 20 sacks a minute could be handled by one operator.

A new cap liner disc suitable for all products except a few organic chemicals was included in its range of packaging service by the Metal Box Co., Ltd. The Selexa cap liner disc consists of cork granules bonded with a new tasteless and odourless synthetic resin which produce a resilient and mould inhibiting material. A white hygienic polythene facing is bonded to the cork.

Besides its mobile drum factory which aroused widespread interest, Metal Containers, Ltd., also had a full scale presentation of its range of chemical containers, drums, kegs, pails, and the Tri-Sure drum closures.

Thanks to its £110,000 research centre recently opened at Leatherhead, the Printing, Packaging and Allied Trades Research Association is now able to extend its scope to all packaging firms, not only member-subscribers. The work of the association was demonstrated under the four main headings: package testing, advisory service, information service, and research.

Satisfactory drum closures have long proved a problem in packaging. A novel and efficient leakproof and tamperproof fitting for cans or drums is the Flexspout shown by Reads, Ltd., of Liverpool. An important cross-section of its boxes and cans, steel and aluminium drums, and kegs of interest to chemical manufacturers was on view.

Metal containers filled by weight operated electrically controlled machines, suitable for use by manufacturing chemists, oil installations and paint factories were demonstrated by Roberts' Patent Filling Machine Co., Ltd.

Carboys packed in specially designed crates for export use were a feature of the display of Francis H. Ward & Son, Ltd. The design is also finding increased favour with home users because of the greater protection afforded to the carboy and easier storage and handling. Another item of interest was a container specially designed to withstand the pressures which are generated by hazardous materials.

Preservation of packing case timber against the ravages of decay and termite attack by pressure treatment and water soluble preservatives was displayed by Hickson's Timber Impregnation Co. (G.B.), Ltd.

Advice to exporters, methods of packing to ensure protection in all climates, and other assistance was available from the Board of Trade information kiosk.

May Solve Problem

SOUTHERN Rhodesia may become an important world producer of platinum if a new method of extraction can be successfully applied, says the *Rhodesian Herald*. The colony has long been known to possess vast deposits of platinum but the difficulty has always been the question of extraction. Now through the efforts of Bulawayo businessmen, a leading British firm of consultants has found a way of extracting platinum from several tons of ore which have been sent from the colony. The next stage will be the erection of a pilot plant to prove that the platinum can be mined on a commercial basis; if this is possible, a large scale mining venture will be launched. The Rhodesian Great Dyke Development Company, Ltd., has agreed to finance the systematic sampling of the ore. So far, at least 80 million tons of ore, which has been found to bear nickel and copper as well as platinum, has been proved. The nickel and copper will be produced as by-products.

The Chemist's Bookshelf

CHYMIA, Vol. III. Editor-in-Chief, Henry M. Leicester. Pennsylvania University Press (London: Geoffrey Cumberlege, O.U.P.). 1950. Pp. ix + 250. 36s.

For any chemist a study of some aspects of the history of his science can not only prove a relaxation, but also may provide a salutary revaluation of prespectives. Those lacking the time to make a detailed study of some part of the history of chemistry may nevertheless take advantage of the works of others. Not the least of the means by which this may be achieved is through the pages of "Chymia," which is subtitled "Annual Studies in the History of Chemistry."

Volume III provides the same human and scientific interest, and the same wide variety of topics as its predecessors, with which many chemists will already be familiar.

From alchemical knowledge and the way in which its spread was assisted by the recent history of the eighteenth and nineteenth centuries, featuring names such as those of Lavoisier, Mohr and Deville, there is much to appeal to anyone who can spare the time (and all of us should) to step aside and relate science and humanity.

One essay, in fact, is even more thorough than we might expect in the pages of these volumes, since it presents an ingenious comparison between two men—one a man of science, the other not—Boyle, the father of chemistry, and his contemporary Bayle, the Dutch historian.

The international nature of the studies is pointed by the fact that of the thirteen papers included in this volume one is in French, one in Spanish, and two are in German. Following previous practice no index is included here, and a biennial index will appear in Volume IV.

The presentation of the volume is pleasing and it should form a welcome addition to the private shelves of any thoughtful chemist.—W.

DIE ENTWICKLUNG NEUER INSEKTICIDE AUF GRUNDLAGE ORGANISCHER FLUOR-UND PHOSPHOR - VERBINDUNGEN. By Dr. Gerhard Schrader. Verlag Chemie, GmbH., Weinheim/Bergstrasse. 1951. Pp. 62. DM. 7.50.

The book summarises the up-to-date development of organic fluorine- and phosphorus-containing compounds used as insecticides. Their best known and already much traded representatives are Blandane, Parathion, Potasan and Miniscol*, the development, preparation, properties, analysis and applications of which are described in detail. The research work was chiefly carried out by the I. G. Farben Industry at Elberfeld and Leverkusen. It was interrupted after the war and even formed an object of inquiry before the Nuremberg trial. English interested scientists owe it to this circumstance, that a condensed English version on the whole subject by the same author has been published with the title: "The Development of Insecticides" as BIOS Final Report No. 714 and 1095 (1947). London: H.M. Stationary Office.

The book deals in separate parts with the two kinds of contact insecticides, with their properties and effects, their esters and similar derivatives now in practical use. It is supplemented with 31 tables and with exhaustive references to literature and patents and should thus be of great value for chemists working in the physiological and preparative line. The experiences and perceptions collected during twelve years of intensive research work well promise that in this special field similar substances may be found with new properties on the sector of pharmacology and of plant protection.—F.N.

Synchro-Cyclotron Ready Soon

Britain's most powerful atom splitting machine, the syncro-cyclotron, now under construction for the nuclear physics department of the University of Liverpool, will be ready for use by the middle of this year after experimental work of tests and adjustments.

* See also CHEMICAL AGE, July 1948, p. 107.

· PERSONAL ·

DR. D. W. F. HARDIE, a member of the research staff of the general chemicals division of I.C.I., has produced "A History of the Chemical Industry in Widnes" as part of the centenary celebrations of the town's basic industry held last year. He tells, in its 250 pages, of the beginnings of the industry in Widnes in 1847, carries it through two wars and the years in between, to its diverse developments in modern times.

The board of Powell Duffryn, Ltd., announce the appointment on 1 February, 1951, of: SIR HENRY WILSON SMITH, K.C.B., K.B.E.; MR. ALFRED READ, M.B.E.; MR. MILES BELFRAGE REID, M.B.E., M.C., J.P., and MR. THOMAS STUART OVERY, as additional directors of the company. Mr. Alfred Read will retain the office of secretary to the company.

MR. DONALD B. MOORE, district manager of North Eastern Trading Estates, Ltd., has been appointed general secretary of the Textile Institute, in succession to MR. HARRY IBBETSON.

In our issue of 20 January it was incorrectly reported that MR. A. H. KAYE, manager of the silicate plant of Joseph Crosfield & Sons, Limited, the Warrington soap and chemical manufacturers, had been appointed to take charge of the company's carbon black plant at Ellesmere Port. Mr. Kaye left Crosfield's at the end of December and is now with Cabot Carbon, Limited, of Stanlow, Ellesmere Port.

Shell Chemicals, Limited, announce that MR. A. J. M. HARRIS, M.B.E., has been appointed manager of their Publicity Department in succession to MR. P. C. DRAKE, F.I.A.M.A., who is now undertaking special managerial work in the company's agricultural activities. Mr. Harris, who has been Mr. Drake's principal assistant since joining Shell Chemicals, Limited, in 1947, was educated at Sherborne and Christ Church, Oxford, and after being called to the Bar in 1932, joined the editorial staff of Benn Brothers, Limited, proprietors of THE CHEMICAL AGE and other trade and technical journals. As a Territorial he served throughout the war, first in Anti-Aircraft Command and, subsequently, at H.Q. 21 Army Group (later B.A.O.R.) as an A.A.G. with the rank of Lieutenant-Colonel, deferring his demobilisation until the end of 1946.

MR. T. E. GARLE, export representative for A. Boake, Roberts & Co., Ltd., is at present on his fourth tour in Africa. He flew to Kano, Nigeria, on 21 January and is including Nigeria, the Gold Coast and Sierra Leone in his itinerary.

MR. WILLIAM BROWN, works general manager of the Dagenham and Monk Bretton, Yorks., works has been appointed a director of W. J. Fraser & Co., Ltd.

MR. P. C. CHAUMETON, B.Sc., F.R.I.C., M.I.Chem.E., has been appointed managing director of Styrene Products, Ltd.

Following the recent appointment of MR. D. A. C. DEWDNEY as co-ordinator of refinery operations, the Anglo-American Oil Co., Ltd., announces the following new positions: MR. T. R. BIRD, formerly manager of contracts and patents department, Esso Development Company, to be manager of Esso European Laboratories; MR. B. E. ROETHELI, formerly manager of the development department, to be manager of contracts and patents department, and MR. H. L. WEST, who has recently been in charge of fuels' research at Esso European Laboratories, to assume the position of development department manager.

OBITUARY

We regret to announce the death of MR. THOMAS DONALDSON, of Ardrossan, technical director of the I.C.I. Explosives group until his retirement in 1944 at the age of 73. He joined Nobel's Explosives Co., Ltd., at Ardeer, in 1890, and transferred to British South African Explosives, Ltd., Modderfontein, as chief chemist. Mr. Donaldson rejoined Nobel in 1914.

The death was reported last week at his home in Leatherhead, Surrey, of PROFESSOR THOMAS TURNER, aged 89. He held the chair of metallurgy at Birmingham University from 1902 to 1926 and was a Bessemer medallist of the Iron and Steel Institute, and Seaman medallist of the American Foundryman's Association. In 1939 he was elected a Fellow of the Imperial College of Science and Technology. The professor's scientific and technical papers included: researches on the influence of silicon on cast iron, which found important practical applications; the production of wrought iron; the composition and treatment of steel, brass and copper alloys, and the properties of metals.

HOME

Phthalate Prices Raised

Owing to rising costs of raw materials British Industrial Solvents announce that it has become necessary to increase the price of all phthalates. As from 1 February, new prices for 5-ton lots, as spot deliveries or on contract over a period of six months, delivered in returnable packages, will be: diamyl phthalate 2s. 9½d. per lb.; dibutyl 2s. 0½d.; diethyl 1s. 10½d.; dimethyl 1s 9½d.; dioctyl: Bisoflex (81) 3s. and Bisoflex (82) 2s. 10d. Prices for one-ton lots in all cases ½d. per lb. more than the above rates.

De La Rue Extrusions

Thomas De La Rue & Co., Ltd., announce that to facilitate the operation of their industrial group, their wholly-owned subsidiary company, De La Rue Extrusions, Ltd., has been placed in voluntary liquidation and its assets and liabilities taken over by the parent company. The business will in future operate under the Plastics Division of Thomas De La Rue & Co., Ltd. This change of status of De La Rue Extrusions, Ltd., will in no way affect the continuity of the business and no change in personnel will be involved.

Phthalate Plasticisers

A. Boake, Roberts & Co., Ltd., have announced that, owing to the increased cost of phthalic anhydride and higher manufacturing costs, the selling prices for phthalate plasticisers were advanced on 1 February, 1951. The new prices are as follows (5 ton lots): Diamyl phthalate, 2s. 9½d. per lb.; dibutyl phthalate to BS 573: 1950. 2s. 0½d. per lb.; diethyl phthalate to BS 574: 1950, 1s. 10½d. per lb.; dimethyl phthalate, 1s. 9½d. per lb.; diethylhexyl phthalate, 3s. per lb. + ½d. per lb. in 1-ton lots.

Acetylene Cylinder "Rockets"

Two cylinders of acetylene gas exploded on a stationary Admiralty lorry at Southampton on 31 January and shot into the air like rockets. One cleared a factory 50 ft. high and crashed into a cottage a hundred yards away, while the other penetrated the roof of a workshop and slightly injured two men. A third cylinder which had exploded a few seconds previously, injured two other men and damaged houses nearby. The lorry caught fire outside the British Oxygen Company's factory and workmen from the factory formed a chain and helped Southampton firemen to carry 30 loaded cylinders to safety.

Wax and Scale Prices

The Anglo-American Oil Co., Ltd., has announced that, as from 29 January, the prices of paraffin wax and paraffin scale have been increased. Increases are as follows:—Paraffin Wax 110°/115°F., 117°/120°F. and 120°/125°F. by £4 10s. per ton; 125°/130°F. and 130°/135°F. by £4 9s. per ton; 135°/140°F. by £4 6s. per ton; 140°/145°F. and 145°/150°F. by £6 7s. 6d. per ton, and 145°/150° F. by £6 7s. per ton. The price of Paraffin Scale is increased by £4 10s. per ton.

Lactic Acid Prices

Bowmans Chemicals, Ltd., have announced that they have had to advance their prices for lactic acid still further due to the increased cost of raw materials. The new prices came into force on 1 February, and are as follows: Dark Lactic Acid, 44 per cent by weight, £105 per ton. Pale Lactic Acid, 44 per cent by weight, £115 per ton. Both prices are ex works, usual container terms.

Atomic Heating Plant

The Government's atom depot at Harwell is to be centrally heated—from an atom pile. After months of experiments scientists at the depot have succeeded in harnessing heat from the high energy pile to an elaborate central heating system. It is expected that the system will be functioning by the end of this month. A Supply Ministry spokesman recently said that they would save a considerable amount of coal. Orders have been placed for similar equipment to be installed soon at the Sellafield, Cumberland, atom station.

New Tin Record

The price of tin which has been gradually increasing since the beginning of the year culminated in a sharper increase last week when a fresh record was reached on 5 February. Spot metal was quoted at £1440, a rise of £41, and three months advanced by £40 to £1405. The increase was partly attributed to stocks being shown exclusive of the Ministry of Supply reserve, which served to emphasise the shortage of the metal in this country.

Property Leased

The Finance Committee of Liverpool Corporation propose to lease to the Distillers Company (Bio-Chemicals), Ltd., Fleming Road, Speke, nearly five acres of land for 999 years at a peppercorn rental, on payment of £3000.

Next Week's Events

MONDAY 12 FEBRUARY

Royal Institute of Chemistry

Leeds: Chemistry Lecture Theatre, The University, 6 p.m. Professor F. S. Dainton: "Nascent Hydrogen—a Re-interpretation."

Institute of Metals

Glasgow: 39 Elmbank Crescent, C.2, 6.30 p.m. A. Dunlop: "Investment Precision Casting."

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 6 p.m. Cantor Lecture. A. G. Beverstock, B.Sc., and F. H. Perkins, B.Sc.: "Training for Industry and the Professions."

TUESDAY 13 FEBRUARY

Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly, W.1., 5.30 p.m. C. W. Bonniksen: "The Manufacture of Alginates."

WEDNESDAY 14 FEBRUARY

Society of Chemical Industry

London: 90 Buckingham Palace Road, S.W.1., 6.30 p.m. Discussion on the Training of Food Technologists.

Dublin: University College, Upper Merrion Street, 7.45 p.m. G. A. Richmond: "The British Alkali Industry—75 Years of Development."

British Association of Chemists

Birmingham: Edmund Street, 6.30 p.m. Dr. L. C. Luckwill: "Plant Hormones."

Institute of Petroleum

Chester: Grosvenor Hotel, 7 p.m. C. D. Brewer and B. H. Thorp: "The Influence of Fuel Characteristics on the Behaviour of Compression Ignition Engines."

London: 26 Portland Place, W.1, 5.30 p.m. T. C. C. Thorpe: "Petroleum Waxes."

Royal Sanitary Institute

London: 90 Buckingham Palace Road, S.W.1, 2.30 p.m. Dr. S. R. Craxford and W. J. Sparkes: "The Problems of Reduction of Atmospheric Pollution." S. H. Richards: "The Measurement and Survey of Atmospheric Pollution."

THURSDAY 15 FEBRUARY

The Fertiliser Society

London: Caxton Hall, Caxton Street, Victoria Street, S.W.1, 2.30 p.m. Dr. Ir. M. H. R. J. Plusjé: "Theory and Practice in the Treatment of Phosphate Rock with Nitric Acid."

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.30 p.m. Tilden Lecture by Professor F. S. Dainton: "Atoms and Radicals in Aqueous Solutions."

Dundee: University College, 5.15 p.m. Frankland Memorial Lecture by Professor W. Wardlaw: "Structural Chemistry."

Royal Institute of Chemistry

Portsmouth: Municipal College, 7 p.m. Dr. E. M. Darmady: "The Chemistry of the Blood."

Exeter: Washington Singer Laboratories, 5 p.m. Sir W. G. Savage: "Some Chemical Problems Affecting Public Health."

FRIDAY 16 FEBRUARY

Royal Institute of Chemistry

Brighton: Technical College, 7 p.m. Dr. W. H. Vernon: "Corrosion Processes and Their Prevention."

The Chemical Society

Birmingham: The University, Edgbaston, 4.30 p.m. J. F. B. Randles: "Physical Chemistry of Nerve Conduction."

Plastics Institute

Birmingham: The James Watt Memorial Institute, Great Charles Street, 6.30 p.m. "Modern Hydraulic Presses."

Society of Chemical Industry

London: Chemistry Lecture Theatre, King's College, Strand, W.C.2, 7 p.m. Three Papers. J. C. McGowan: "The Physical Toxicity of Chemicals. I: Vapours." S. H. Harper: "The Lactonisation and Abnormal Esterification of the Chrysanthemic Acids." A. Albert: "The Pteridines."

SATURDAY 17 FEBRUARY

Institution of Chemical Engineers

Leeds: The University, 2.30 p.m. N. L. Franklin, J. S. Forsyth and H. Winning: "A Mechanical Analogue for the Solution of Distillation and other Separation Problems."

New Shetland Lime Quarry

A new lime quarrying project has been launched in Shetland to work deposits of good quality lime at Girista. A company has been formed under the name Shetland Lime, Ltd., and capital is being raised on a co-operative basis, potential users being invited to become shareholders in the development.

The Stock and Chemical Markets

MARKETS have been buoyant, largely due to further selling of nationalisation steel shares and reinvestments in industrial and commodity shares. Declines in steel shares were again moderate and not more than a few pence, because they were again being bought by some of the big financial and investment institutions as at current levels they are equivalent to steel stock quoted at a discount of £3. Gilt-edged stocks generally have receded further, but there is a growing assumption that before long there will be a rally.

Leading industrial shares have again moved higher on hopes of increased dividends. Nevertheless, the outlook is difficult to assess because of rising costs, shortages of materials for industry owing to the arms drive, and higher taxation expected in the next Budget. Owing to these factors there has been a tendency to favour mining and commodity shares. The latter have responded to the further rise in prices (tin was prominent in metals at yet another all-time record price). Many mining companies are registered overseas and are not subject to U.K. taxes.

Chemical and kindred shares again reflected the uptrend in stock market value. Imperial Chemical were up to 45s. 4½d. helped by continued confidence in the market that the 10 per cent dividend will be maintained and by the assumption that armament and allied work may offset any contraction in some other activities of the group. Monstanto were higher again up to 52s. 9d. on market expectations of good financial results. Albright & Wilson 5s. shares were dealt in up to 16s., Brotherton 10s. shares were 21s. 4½d., while Laporte Chemicals 5s. units have been active around 11s. 3d. Turner & Newall have firmed up to 90s., and United Molasses at 57s. rallied on renewed talk of share bonus prospects. Borax Consolidated deferred units at 60s. 3d. were higher in response to continued market hopes of a higher dividend. British Oxygen were favoured up to 97s., British Aluminium up to 43s., and United Glass Bottle up to 88s. 9d., Fisons were more active up to 27s. 6d.

Boots Drug strengthened to 48s. 9d. and Glaxo Laboratories have been active around 63s. 9d. helped by hopes of higher dividend prospects. British Glues 4s units at 23s. 3d. were firm again. Associated Cement at 89s. also moved in favour of holders, as did Lever & Unilever at 45s. Lewis Berger 4s. units at 33s. 6d. were good among paint shares.

Elsewhere, Staveley were active and at 86s. 3d. regained part of an earlier decline, the news that arbitration is to settle nationalisation compensation being regarded as assuring a fair deal. Nationalisation steel shares were generally 3d. to 1s. lower on balance, reflecting selling and switching into other industrial shares before next week's exchange into steel stock becomes due. General Refractories held up well at 24s. 9d., and elsewhere, Triplex Glass have held firm at 25s. 9d. at the time of writing. Among textiles British Celanese and Courtaulds were both inclined to improve. Plastics were generally steadier with British Xylonite at 86s. 3d., British Industrial Plastics 2s. shares 7s. 1½d., De La Rue 26s. 9d, and Kleemann improved to 13s. Oil shares have been more active with Shell at 84s. 4½d. in response to higher dividend estimates. Anglo-Iranian were slightly over £5⅝ with Burmah Oil at 59s. 4½d. and Trinidad Leaseholds 5s. units 26s. 9d.

Market Reports

LONDON.—With nearly all sections of the chemicals market in a strong position it is not surprising that contract delivery specifications are reported to cover substantial quantities, and with production limited by raw material supplies it is becoming increasingly difficult for suppliers to maintain the usual scale of deliveries to regular consumers. The demand for the whole range of soda products continues steady, while available parcels of the potash chemicals are being fully absorbed. Interest has been fully sustained in the solvents, and there has been a brisk inquiry for the red and white leads with other non-ferrous metal compounds continuing in steady call. Lead nitrate is reported dearer. Supplies of coal tar products remain below demand and new business is difficult to negotiate. There has been no improvement in the supply position for light distillates, while carbolic acid and cresylic acid continue to be in good demand.

At the time of going to press we are advised that the prices of red and white lead have been increased. The new basis prices are: Dry white lead, £162 per ton; Ground white lead, £179 per ton; Dry red

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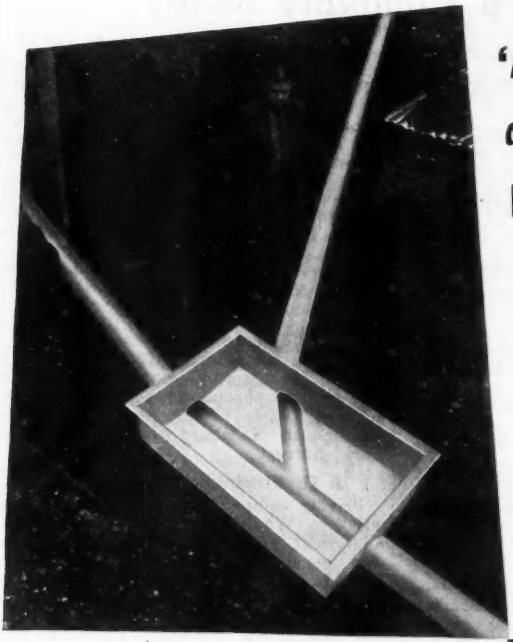
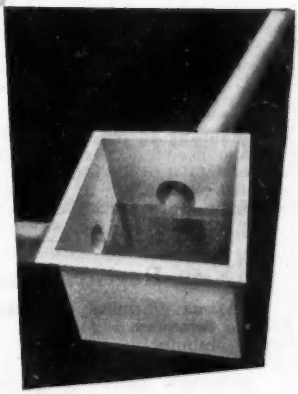


'ALKATHENE' *corrosion-resistant* DRAINAGE SYSTEMS for Chemical Plant

Acid-resisting drains and inspection pits constructed from 'Alkathene' sheet and extruded tube by Messrs. Prodorite Limited, Wednesbury, Staffs.



Because 'Alkathene' is light, flexible and easily fabricated, 'Alkathene' drainage systems and chemical pipework are quickly and simply installed. Yet the toughness, durability and resilience of 'Alkathene' enable it to withstand all service conditions — *and it is unaffected by most corrosive liquids at temperatures up to 65°C.*

'Alkathene' is the registered trade mark of polythene manufactured by I.C.I.

ICI

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1.

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Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CHEMRING, LTD., London, W.C., manufacturers of chemical products, etc. (M., 10/2/51). 21 December, supplemental assignment securing to Barclays Bank, Ltd., all moneys due or to become due to the bank; charged on certain contract moneys. *——. 28 September 1950.

PARKO PROCESS, LTD., Grimsby, plastic manufacturers. (M., 10/2/51). 18 December, debenture, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *Nil. 21 February 1950.

VERVA, LTD., London, W.C., chemists. (M., 10/2/51). 18 December, debenture, to A. C. Wyatt, Leeds, securing sums which the holder may be called upon to pay under a guarantee; general charge. *Nil. 10 August 1949.

Increases of Capital

The following increases of capital have been announced: MANGERS CHEMICAL CO., LTD., from £100 to £185,000; AMASAL, LTD., from £100 to £318,300; J. MANGER (HOLDINGS), LTD., from £10,000 to £60,000.

New Registrations

Ajama Chemical Co., Ltd.

Private company. (491,014). Capital £1000. Manufacturers of and dealers in chemicals, gases, disinfectants, fertilisers, salts, acids, etc. Directors: S. Anysz and O. Janser. Reg. office: North Hyde Works, Southall Lane, Southall, Middx.

Filson, Ltd.

Private company. (491,021). Capital £100. Mechanical, electrical and chemical engineers. Directors: T. W. Dawson and R. R. Phillips. Reg. office: 87a Upper Richmond Road, S.W.15.

George T. Gurr, Ltd.

Private company. (491,119). Capital £10,000. To acquire the business of a chemical manufacturer now carried on by George T. Gurr. Directors: G. T. Gurr, W. M. Gurr, and N. A. Virgo. Reg. office: 136 New Kings Road, S.W.6.

Manley, Wright & Co., Ltd.

Private company. (490,911). Capital £100. Brokers of and dealers in dyestuffs, colours, chemicals, drugs, paints, etc. Directors: W. H. Manley, and K. W. Jones, 55 Edward Street, Fallowfield, Manchester, 14.

P. & H. Phosphates, Ltd.

Private company. (28,137). Capital £1000. Manufacture, export and deal in phosphates, phosphoric acid, etc. Subscribers: C. L. Todd. Secretary: M. L. Lepop, 33 Salisbury Road, Worcester Park, Surrey.

J. H. Richardson (Chemists), Ltd.

Private company. (491,068). Capital £1000. Wholesale or retail consulting, analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: Mrs. A. Richardson and T. Coates. Reg. office: 173 Roker Avenue, Sunderland.

THE STOCK AND CHEMICAL MARKETS

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lead, £155 per ton; Red lead ground in oil, £175 10s. per ton.

MANCHESTER.—A steady movement of contract supplies of a wide range of heavy chemical products has been reported on the Manchester market during the past week. The firm undertone continues in all sections, with a number of lines in short supply, and likely to remain so while the shortage of raw materials is unrelieved. A fair aggregate volume of new business has been on offer by home consumers and export buying interest has been sustained. In the fertiliser trade a fair movement of supplies has been reported, with a brisk demand experienced in most sections of the market for the tar products.

GLASGOW.—The very unsettled state in general of market prices is leading to quite a bit of stockpiling and, in general, business is exceedingly active. The export market is now very lax owing to the scarcity of chemicals and raw materials available for export.

German Chemical Industry

REMOVAL of the limitations and prohibitions imposed by allied legislation was urged by the Association of the German Chemical Industry in a resolution announced by its central committee last week.

In view of the changed economic and political situation in the west, and the new tasks which confront the German chemical industry, the association considers this to be "a dictate of political common sense" and urges that the intergovernmental study group in London should work out proposals for freeing the industry.

Amplifying the resolution, the president of the association, Herr Menne, stated that in the Russian zone the Buna synthetic rubber works at Schkopau had a production of between 70 and 80 thousand tons a year; the Fischer-Tropsch synthetic petrol plants at Schwarzheide and Lützkendorf were turning out between 100 and 150 thousand tons a year; and hydrogenisation at Leuna Bëhlen and Zeitz was running at one million tons a year.

In the west, on the other hand, six Fischer-Tropsch works were idle. Three of these could be brought into immediate production.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

ASSISTANT SHIFT CONTROL MANAGER required by the Division of Atomic Energy (Production), Windscale Works, Sellafield, Cumberland, to be responsible for implementing policy and co-ordinating activities, including nuclear and chemical processes, in a large factory.

Candidates must either have an honours degree in chemistry or chemical engineering, associateship of the Royal Institute of Chemistry, corporate membership of the Institution of Chemical Engineers or equivalent qualifications. They must have had at least five years' supervisory experience in a chemical factory and be capable of controlling factory activities during closed hours.

Salary will be assessed according to qualifications and experience within the range, £720–£960 p.a. A house will be available within a reasonable period for the successful candidate, if married. The introduction of a superannuation scheme is under consideration. Applications to **Ministry of Supply, D.At.En. (P), Risley, Nr. Warrington, Lancs., quoting reference W.C.4/4.** Rs.3860-20-JS-22/1/51.

CHEMICAL ENGINEER, qualified and with experience in Electro-Chemistry, especially Brine Electrolysis, is required by Works near Chester, for the development of electrolytic and other ancillary plant. Salary in accordance with qualification and experience, which should be stated in application to Box C.A. 2981, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

CHEMIST required by well established Rubber Company. Applicants should be under 30, and hold B.Sc., A.R.I.C. or A.I.R.I. qualifications. Further details on application. Box No. C.A. 2982, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

COLONIAL DEVELOPMENT CORPORATION require an **ASSAYER** for laboratory attached to flotation mill East Africa. Applicant must be thoroughly trained and experienced in routine assaying of gold and base metals, particularly copper, zinc and cobalt.

Salary £500-£800 per annum, depending on training and experience. Overseas allowance in addition; permanent pensionable post; accommodation at nominal rent; outfit allowance; generous leave at full salary.

Please write for application form to **Personnel, 19, Curzon Street, London, W.1,** quoting serial number 55, by 25th March, 1951.

DESIGN ENGINEERS, with B.Sc. Degree in Mechanical Engineering or equivalent, and not over 40 years of age, are required by The Bahrein Petroleum Company, Limited. Experience to have been in design of Oil Refineries, coal tar, chemical distillation or similar plants, involving electrical and steam systems, pressure vessels, fractionating columns, heat exchange and pumping equipment. Salaries according to qualifications and experience, plus kit allowance. Provident Fund. Free board and air-conditioned accommodation, medical attention. Low living costs. Two-year agreements with paid leaves and transportation. Write, giving full particulars of age, education and experience, to **Box 3785, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

OIL Refinery Contractors handling large contracts for Refinery Plant, require **CONTRACT ENGINEERS** in their London Office. Duties involve broad direction and co-ordination of all phases of the work, including planning, drafting, purchasing, progressing and erection. Desirable qualification is previous experience of Refining Industry or Heavy Engineering, including a wide knowledge of pumping, heat-exchange equipment and instrumentation, and the appointment offers excellent prospects to suitable men. Applicants should write fully, stating qualifications, age and experience, to **Foster Wheeler, Ltd., 3, Ixworth Place, London, S.W.3.**

SITUATIONS VACANT

PHYSICAL CHEMIST. A Graduate, age 35 to 45, preferably with a higher degree and industrial experience, is required by J. & G. Cox, Limited, Glue and Gelatine Manufacturers. The individual appointed will be expected to master the technical details of manufacture, and the scientific controls used in the industry. He will understudy the Technical Director, and there will be opportunities for research. Salary according to age and experience. Applications should be sent to **The Director, J. & G. Cox, Limited, Gorgie Mills, Edinburgh, 11.**

PLANT DEVELOPMENT AND PROCESS ENGINEERS, qualified in Chemical Engineering or Petroleum Refining Technology, required by Bahrein Petroleum Company, Limited. Age limit, 25-40. Two-year agreement periods with passages and paid leaves. Free air-conditioned accommodation, board and medical attention, kit allowance, low living costs. Salary according to experience. Write, with full particulars of age, education, experience, to **Box 3184, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

REQUIRED. YOUNG MAN, age not over 28, to join firm of chemical importers and manufacturers selling solvents and organic chemicals, for outside sales representation, and if necessary, other duties. London area, occasional provinces, having degree in chemistry, previous experience desirable, good personality essential. In reply, state salary required and full details of education and experience. Write Box Z. 207, Willings, 362, Grays Inn Road, W.C.1.

RESEARCH AND DEVELOPMENT CHEMISTS required by the Division of Atomic Energy (Production), Ministry of Supply Factory, Capenhurst, Nr. Chester, to take charge of and to undertake chemical research and development work.

Candidates must have either an honours degree in chemistry, Associateship of the Royal Institute of Chemistry, or equivalent qualifications. Alternatively, for the higher posts, they must have either an honours degree in chemical engineering, corporate membership of the Institution of Chemical Engineers or equivalent qualifications. Candidates for the higher posts must also have had at least three years' experience in research or development work and preferably have had experience in flourine chemistry. Appointments will involve a short initial period of service at Springfields Factory, Salwick, Nr. Preston.

Salaries will be assessed according to qualifications and experience within the range, £720-£960 p.a. and, according to age and experience, within the range £330-£720 p.a. Houses will be available within a reasonable period for the successful candidates if married. Applications to **Ministry of Supply, D.At.En. (P), Risley, Nr. Warrington, Lancs.** Rs.3813-15 (MHM) 18/1/51.

RESEARCH CHEMIST required for work in the phosphate and fertiliser fields. Applicants must have a degree or the equivalent, together with several years experience of chemical research and development (inorganic and physical). The successful candidate will have the opportunity of gaining some administrative experience. The position is permanent and pensionable and will command an initial salary in the range £700-£900.

Apply in confidence to the **Personnel Officer, Scottish Agricultural Industries Limited, 39, Palmerston Place, Edinburgh 12.**

SITUATIONS VACANT

VACANCIES exist in a variety of fields in large industrial laboratories for **CHEMICAL ASSISTANTS.** Positions are well paid and progressive.
Apply in writing to :
THE RESEARCH MANAGER,
LAPORTE CHEMICALS LIMITED,
LUTON.

WAREHOUSE MANAGER required by old-established South Wales firm of Laboratory Furnishers, with thorough general knowledge of the Trade. Permanent position. Must be keen and industrious with personality. Write stating age, detailed experience, and salary required to Box No. C.A. 2983, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

FOR SALE

600

PROCESS PLANT

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